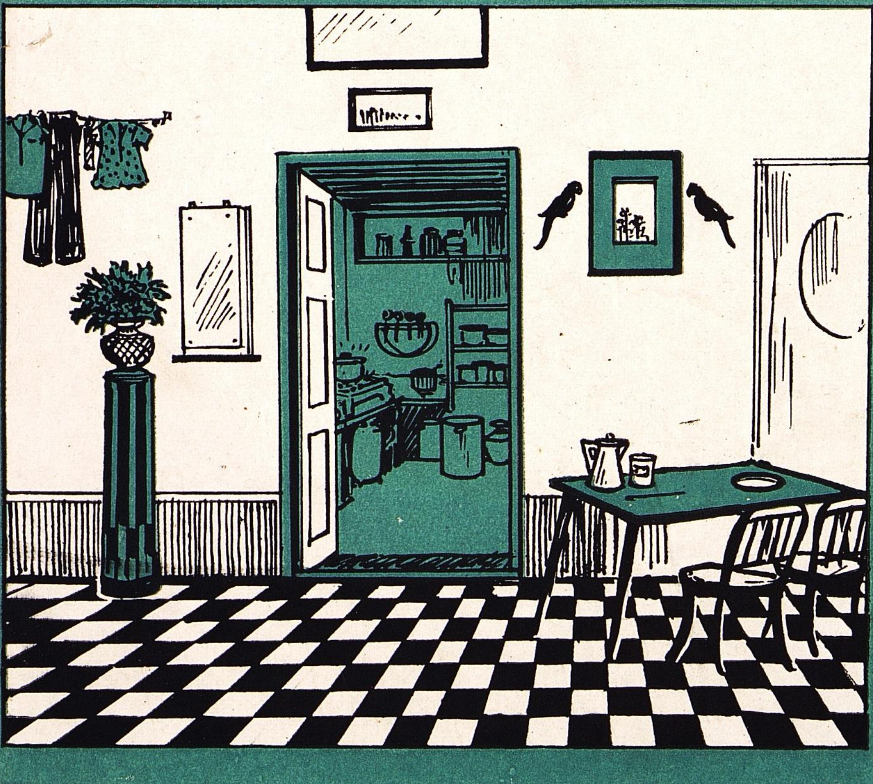
HOME SCIENCE

HIGHER SECONDARY - FIRST YEAR

VOL. II



TAMILNADU TEXTBOOK SOCIETY

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Higher Secondary — First Year

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CHAPTER V

Home Management

HOUSING AND SITE SELECTION

1. Housing

From being a nomad, man has travelled far to settle himself in man made environments of different kinds. House has become a basic necessity for human existence in a civilised society to satisfy his physical, social and aesthetic needs.

Importance of house

A house is a dwelling unit — a physical structure, an architectural piece, a work of art and a financial investment. It is a treasure house of personal belongings and an exhibition hall of individual taste. A house is a shelter consisting of walls, doors, windows, roofs etc. in which human beings live. It may have a group of rooms or a single room, occupied or intended for occupancy. It may consist of separate living quarters or a flat with other dwelling unit.

1. The house forms the centre of family life. However much one succeeds in the public order of life (in business, profession, politics etc), he needs a house to satisfy his private order of living with his family.

2. Home provides space for group and individual activities of the members of the family, such as recreation, reading and hospitability. It meets the needs for activities such as cooking, serving, washing, cleaning, storage and disposal of waste. It provides space for children's play and adolescent hobbies, and adults' creativity.

3. House offers protection for all the family members to carry out a satisfying family life especially the helpless infant and the very old. The house offers protection from sun and rain, heat and cold, and from all unsocial or anti-social elements outside.

4. The comfort and convenience one visualises, the health and safety one enjoys are basically dependent upon the house and its construction features.

5. The house and its surrounding are status defining to the individual and many announce to the world the economic and social status of the family.

6. The house offers facilities for self expression and a degree of freedom of action.

7. The house forms a business centre in many places especially in rural areas.

8. Housing is the determining factor in the standard of living of an individual and shapes his attitudes and ways of life. The condition of housing is a measure of nation's progress.

Thus house should provide for rest and quiet, relaxation and a source of peace, self expression and creativity, physical, moral and social development of the inmates. It should remain as a proper background contributing to the home life of the members.

Assignment

Discuss the various ways a house functions in the development of the individual, family and nation.

2. Site selection

The convenience of a house depends mainly on the location of the home and proper planning of the house. The site must

function as regards convenience for the family. It should be expressive of the same character as the house that has been planned. It should in addition have some claim to beauty. Careful consideration must be given to the selection of site whether the family buys, builds or rents the house. Hence **selecting a site needs satisfaction in the following areas :**

i. Physical features

The site should be regular in shape and large enough to acommodate the kind of building which will be built in it. A low lying site is unhealthy during rainy season. It should be on elevated ground to have a wider and brighter view of the outside unit and to facilitate flow of rain water from the building. A corner plot and a plot lying near roadside is better. Site which faces North South direction give extra advantage in house planning.

ii. Soil conditions

The best type of soil is one when soft soil at the surface and hard soil beneath it is found. A mixture of sand and gravel is also good. Rock makes a firm foundation, but poses difficulty while levelling the ground or excavating the ground due to its hardness Sandy site tend to be hot Very deep foundations are needed if sandy site is chosen. A clay site is unsuitable because clay holds water for a long time. Reclaimed land filled with rubbish is also not good for making foundation.

iii. Practical convenience

The value of the site depends upon the conveniences available around. The facilities for transport, education, shopping and recreation are very important. The site should be within easy reach of a school, market, bank and nursing home. The nearness to a railway station is convenient, but it should not be very close as to disturb sleep. Park, library, temple, clubs etc . will also help in the recreational, educational and religious aspects of the family members.

iv. Public utilities available

Sanitary facilities for sweepers, drainage, sewage, septic tanks and conveniences like water, electricity and gas should be easily available in the locality.

If public utility services are not available investigation of the possibility of developing both water and sanitary systems should be made.

v. Sanitary facilities

There should be no stagnant pools of water, tanks and unused wells around the site. It should not be a breeding place for flies and mosquitoes.

A crowded street with heavy traffic is unsuitable due to dust, noise and danger of accidents.

Cattle sheds, poultry pens and factories unit give out smoke and industrial odours which are unhealthy. The site should never be surrounded by public drainage and toilet. Site with modern sanitary facilities are the most suitable.

vi. Peaceful neighbourhood

Having good neighbourhood adds to the happiness of the family. The people living in the surrounding should be friendly and co-operative. The economic and social status of the neighbours should be on par with the occupants. The area should be pleasant and charming. It is good that one buys a site in a developed area instead of buying a land in an undeveloped area.

vii. Legal characteristics

The legal description of the plot and the exact location of the plot must be known. A legal advisor should be consulted, the

place surveyed and the boundaries marked out. The deed restrictions, the zoning laws, the property taxes, special assessments and the right of the easements should be fully understood before purchasing a plot.

One should never buy a plot in a hurry. Careful thought over economic aspects should also be given. Health and happiness of living is based on proper selection of site and organised construction of house.

Assignment

Describe the site of your home and school with reference to the point which you aspire to have for a site.

Examine the best area in your town for residential locality.

3. Principles of organising a house

Factors to be considered while planning a house are aspect, prospect, privacy, grouping, roominess, furniture requirements, circulation, flexibility, sanitation and practical consideration.

i. Aspect

Aspect is the arrangement of doors and windows on the outside walls of a house which allows good breeze, sunshine and a good view of the nature. If the environment is pleasant, people can be contented and happy. Aspect is also needed from hygienic point of view. With careful placement of windows, it is possible to admit sun's rays into any desired room.

Kitchen should face the eastern aspect so that the morning sun's rays can purify air. Bed rooms should have southern aspect either south-east or south-west to facilitate enjoyment of good breeze. The living room can be north-east or south-east in its aspect.

ii. Prospect

It is the impression that the house creates on a person who views it from outside. It must be attractive in appearance, modern, cheerful and comfortable. A beautiful window, carved pillars, modern design on the walls and roof may add to the charm of the house.

iii. Privacy

Privacy is of two kinds — privacy of the entire house from the road side; privacy of each room from other rooms and from the entrance.

Privacy from outside can be gained by planting trees and growing creepers or having a compound wall; privacy within the house can be obtained by proper arrangement of doors, windows and walls, proper grouping of rooms and having curtains for doors and windows.

Privacy to bedrooms, toilet rooms, water closets and pressing rooms are of supreme importance.

iv. Grouping

It is the arrangement of rooms in the house in respect to their relative positions and activities towards each other — the dining room close to the kitchen and living room, the living room near varandah, the toilet near bed room and so on. Grouping is based on convenience.

v. Roominess

It is the spacious effect a room gives to those who live in. The available space should be fully made use of. One can have builtin wall cupboard, shelves and storage area so that the floor of the room is left free for various activities. The same way the space under the staircase, window sill, area below the ceiling (attic) can be made use of for storage.

The size and shape of the room, the furniture arrangement as well as the colour scheme used have a bearing over the roominess of the house.

vi. Furniture requirement

The rooms must be planned with due thought to the furniture to be placed there. The type, the position, size and the number must be planned earlier in respect to the size and placement of doors, windows and builtins in the room.

vii. Circulation

The circulation from room to room must be good. Good circulation means independent entry to each living space through a common space. It should provide privacy to the members and not disturb any member doing his/her work in the room. Straight, short, direct passages must be provided Circulation can be achieved by proper placement of the doors, grouping of the rooms and furniture arrangement.

viii. Flexibility

This means making use of a room originally designed for one purpose for different purposes at various occasions; e.g. converting a living room to a dining hall during function, a back varandah near the kitchen to be used as play centre for children, a dining room converted as child's study centre or play centre.

Screens, cupboards, folding partitions may help to make a room flexible and serve more than one purpose.

ix. Sanitation

It includes provision of light and ventilation and attention to general cleanliness and sanitary conveniences. There should not be any room in a house without enough light. Ventilation

must be adequate. It means supplying fresh air and evacuating polluted air. Opposite windows and door as well as ventilators must be provided for easy movement of air.

Sanitary convenience as provision for drainage water, refuse waste and human waste must be planned ahead.

x. Practical considerations

One may have to take into consideration while planning the house the following practical points as strength, convenience, comfort, simplicity, beauty, possibilities of extending the house in the future and above all economy.

Since house is an immovable property and an asset, proper planning is very essential.

Assignment

Visit a home under completion, analyse with regard to the satisfaction of the principle of planning and suggest modification.

4. Allocation of space in the house for various activities

The design of every house is an act of social importance. It influences the future trend of family living. The house whatever form it takes is the centre of family life. It must provide space for group and individual activities of the family such as recreation, reading, share experience and affectionate life among family members and the reception of visitors. It must afford facilities for the withdrawal of individuals for study, rest or thinking during periods of family members, activity, for sleeping with its related functions. It must make easy such activities as food preparation, the serving of meals, dish washing, laundering and house cleaning, storage and disposal of waste. It must make available space for children's play, adults' hobbies, reception of guests, personal hygiene etc.

The house should be arranged as to facilitate these essential activities. The functions of a family life or activities which the family perform are :

1.	Rest and relaxation activities	7.	Laundering, cleaning, other maintenance
2.	Entertainment	8.	Sleeping
3.	Play	9.	Bathing and grooming
4.	Study	10.	Persuing hobbies
5.	Eating	11.	Storing
6.	Preparing food	12.	Circulation

Classification of areas	Rooms or space in the house	
Social and Recreation area (Public) (Those in which it meets the outside world)	Living room Parlour Reception Entrance Library	Dinning, Porch Study Music Recreation Games room
Service or work area (Those in which household operations are carried on)	Kitchen Laundry Serving Service path Drying yard	Storage areas Garage Office Study
Rest or private area (Those in which the family as individual seek)	Bedroom Hall Bathroom	Dressing room Porch for sleeping

Assignment

Observe the various activities carried on in the various rooms of your home.

5. The plans

The plans usually required in connection with the building are:

i. Site plan

ii. Floor plan

iii. Cross section

iv. Elevation

v. Perspective view

vi. Landscape

i. Site plan

This consists of drawing in which the location of the particular building in the particular plot is shown with reference to the surrounding building plots and particularly the nearest street or road giving access to the place. It includes

(a) The length of the boundary of the plots showing the outline.

(b) The plots adjoining it on all sides with the numbers.

(c) The nearest street.

(d) The north direction indicated by an arrow, with the letter 'N' at its head.

(e) The exact location of the proposed building, out-houses and other pertinent structures in the plot and the space proposed to be left between the building and the boundaries of the plot.

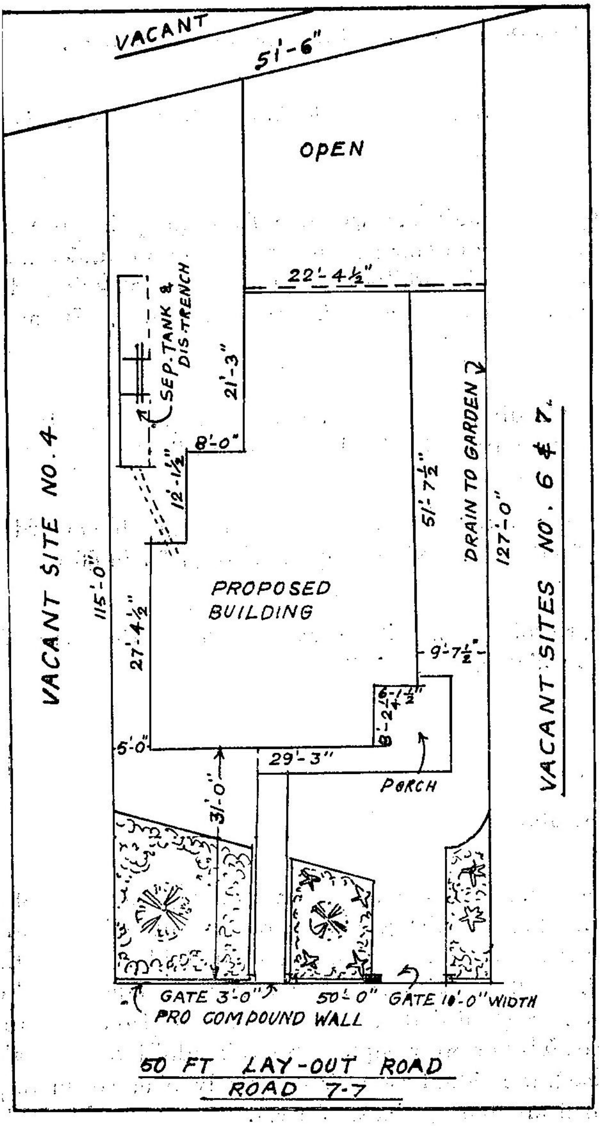


Fig. 45

Site Plan

(f) The drainage line with inspection chambers.

(g) The public water main from which supply is to be obtained,

The above details are necessary from the point of view of the Municipal requirements and the common understanding of the plan. But in addition to these the following details are necessary to help the architect or engineer. It can also include

(h) The direction of the prevailing wind. (This is shown by an arrow inclined to the north line)

(i) The direction and amount of the downward surface slope. (Shown by an arrow 1 ft. in 60 ft.)

(j) Results of the pits excavated to see the type of soil available.

ii. Floor plan

Floor plans of as many as the building may have should be shown. It shows the general arrangement of the various rooms, the length and breadth of each individual room, thickness of the walls, positions of the doors, windows and cupboards etc. and all that can be seen in a horizontal plan. In a very **carefully drawn complete plan,** in addition to the above details each individual room is separately planned in respect of the furniture and fittings, for e.g. the beds, tables, chairs .... the cooking range, the sink, storage cabinets, the positions of the various electrical fittings in the different rooms etc.

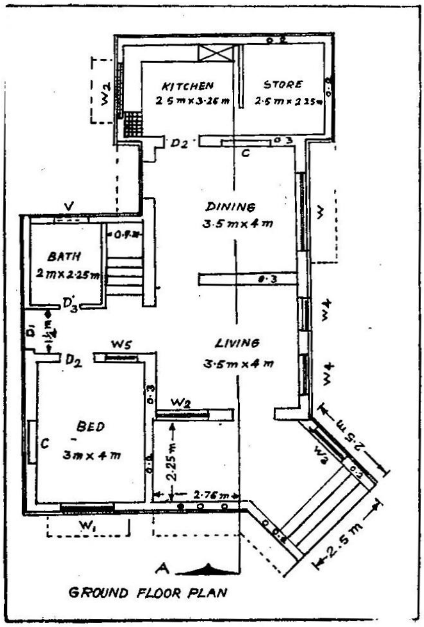


Fig. 46 A

Floor Plan

Type	Description	Size
D	Door	1·2 m×2·1 m
D_1	Door	1·0 m×2·1 m
D_2	Door	0·9 m×2·0 m
D_3	Door	0·8 m×2·0 m
W	Window	2·0 m×0·75 m
W_1	,,	1·8 m×0·9 m
W_2	,,	1·5 m×0·9 m
W_3	,,	1·2 m×0·9 m
W_4	,,	0·9 m×1·8 m
W_5	,,	0·9 m×0·5 m
V	Ventilator	0·9 m×1·5 m
C	Cupboard	1·2 m×0·5 m

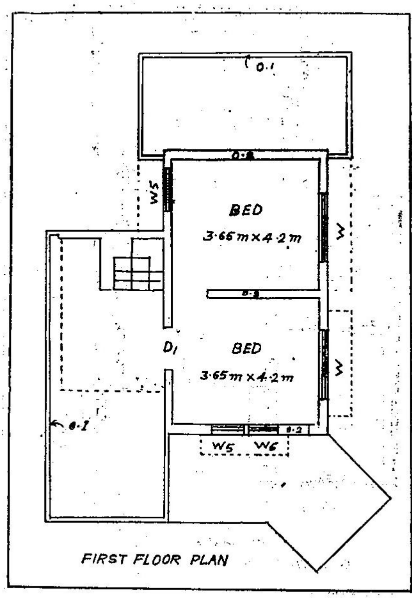


Fig. 46 B

iii. Cross section

It may be rather difficult for a layman to draw and understand cross sectional plan. But it is very important from the architect's, contractor's, supervisor's point of view. It explains fully the details from roof to the foundation in a vertical position, in one plane as the heights of the windows, doors, built-in cupboards — their positions above floor level, height of the ceiling, the thickness of the floor wall, the depth of foundation and so on.

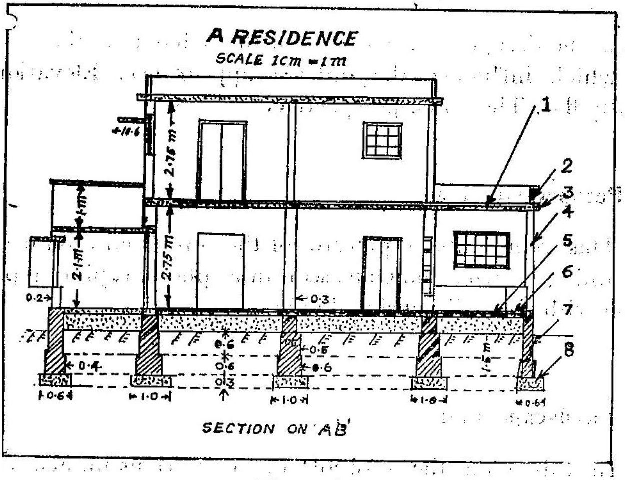


Fig. 47

A Residence cross section

1. Weathering course with two layers of flat tiles 2. Parapet 3. Roofing 4. Super structure with brick 5. Flooring coverete 6. Plastering 1 cm thick 7. Foundation with masonry 8. Foundation concrete

iv. Elevation

This is also considered very important. The front elevation shows the type and location of the window, the placing of the

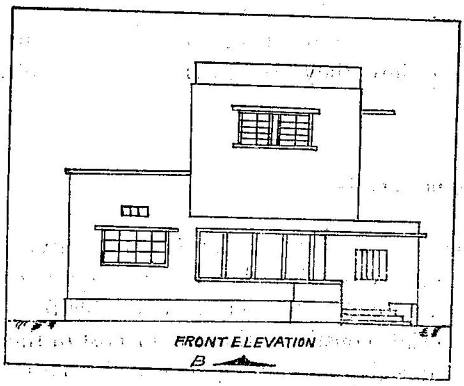


Fig. 48
Front elevation

doors, the designs and location of the balconies, the roof lines etc. which influence the outside appearance. Elevations are usually flat. They lack perspective.

v. Perspective view

This represents a picture of the proposed house closely resembling its true image as seen in a photographic representation with three dimensional effect.

vi. Landscape plan

In this plan the position of the various plants, shrubs, lawns, paths, drives etc. are shown. The beauty of the building is enhanced by creating a surrounding and giving it an atmosphere so as to make it look like a home rather than a house.

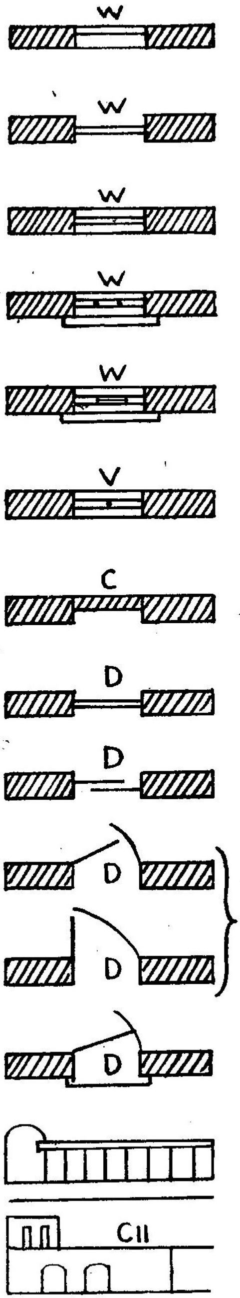
Thus plans help to transmit ideas from the person who conceived it to those who are responsible for implementing it.

Assignment

Examine the blue prints of house plans from an architect and understand how they are drawn using symbols.

6. Building materials

The beauty, utility, economy, simplicity, comfort and convenience of the houses depend to a large extent on the selection, use and care of materials available for construction. Building materials constitute the major cost of the house. The cost of the materials takes 40 percent of the cost of the house. The materials commonly available in the country are natural materials and man made materials.



W — Window (double lines along the outer edge of wall)

W — Window (double lines with dots in the centre of wall)

W — Window (double lines in the centre)

W — Single Sash Window

W — Double Hung Window

V — Ventilator

C — Built in Cupboards (Recess in walls)

D — Door

D — Double sliding door

D — Swinging doors

D — Outside door

Staircase

CH — Chula range in kitchen

Fig. 49

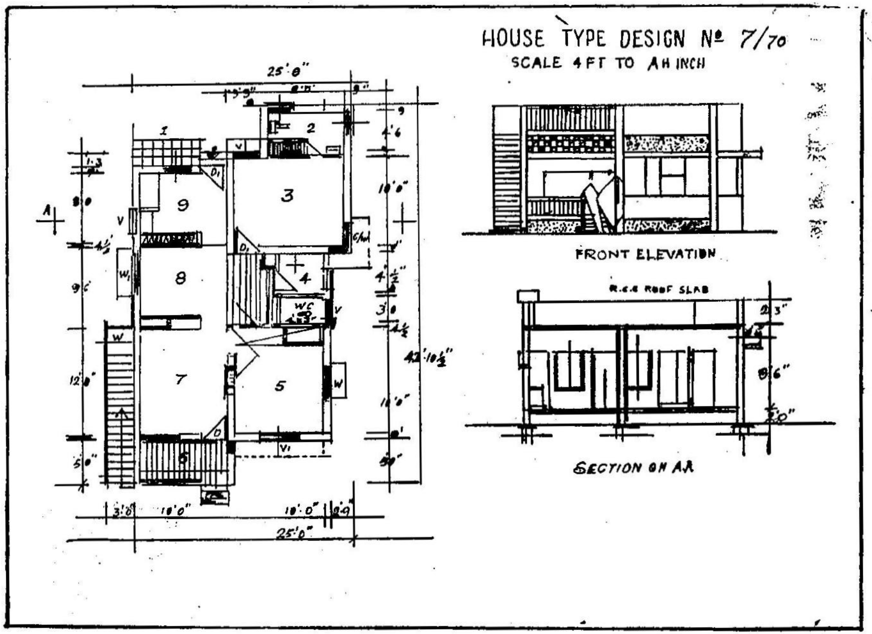


Fig. 50
House Type Design

1. Service Platform 2. Toilet 3, 5. Bedroom 6. Front Verandah 7. Drawing Room 8. Dining Room 9. Kitchen

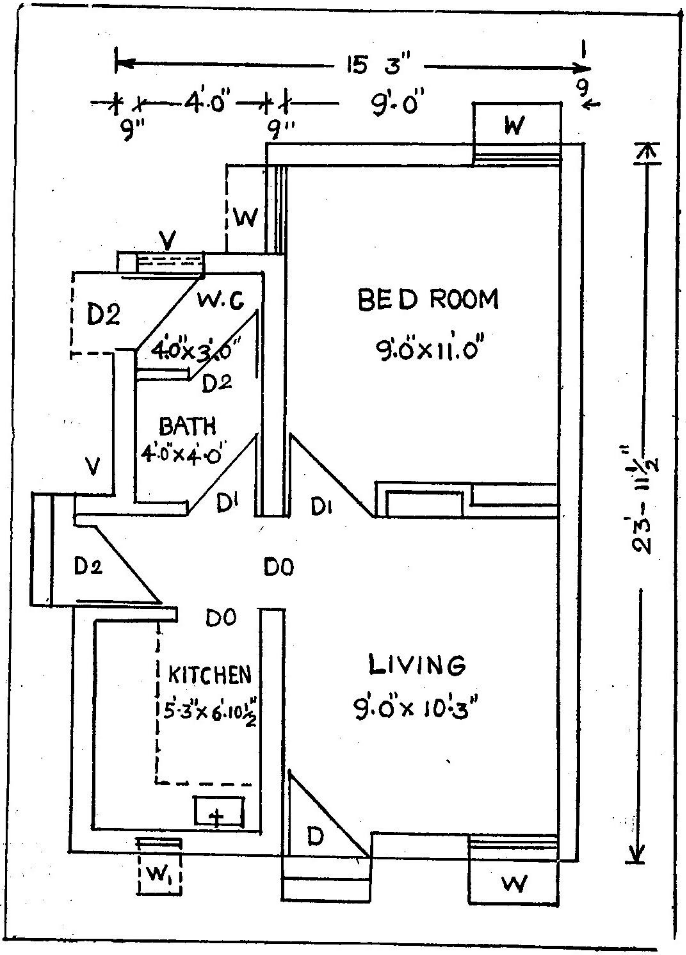


Fig. 51

L. I. G. House Type 'C'

D	Door	: 3' — 0" X 6' 6"
D_1	Door	: 2' — 0" X 6' 6"
D_2	Door	: 2' — 6" X 6' 6"
W	Window	: 3' — 0" X 4' 0"
W_1	Window	: 1' — 7" X 3' 6"
V	Ventilator (Jalli)	: 2' — 6" X 1' 6"

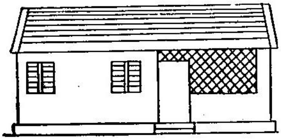


Fig. 52-a

Front Elevation

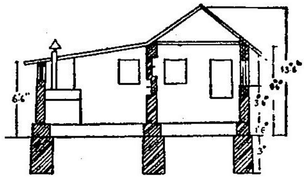


Fig. 52-b

Sectional Elevation

Plan of the low cost Rural House

Natural materials : Mud, stone, sand, wood, lime and leaves.

Man made materials : Cement, brick, tiles, metals, glass and plastics.

Mud

Mud is most commonly used all over the country than any other material. It is oldest universal building material ever since man felt the necessity of a house. Mud is cheap, easily made and repaired, sufficiently lasting maintain an equitable temperature both in winter and summer, satisfy the Indian economic conditions and to a certain extent absorbant too. Use of mud mixed with chopped straw and cowdung helps for plastering inside and outside of walls and floors. A thin coating of cowdung and cement maintain the surface in a good condition.

Stone

The stone used for foundations and walls should be sound and free from cracks and decay. Stones such as granite, marble, slate, sand stone, limestone are commonly utilised as building materials. Waxing and polishing make them charming. Gravel

which are stones not larger than ¾ inch is a material vitally needed for building. Care needs to be exercised in using proper sizes of stones and correct interlocking in the width of walls.

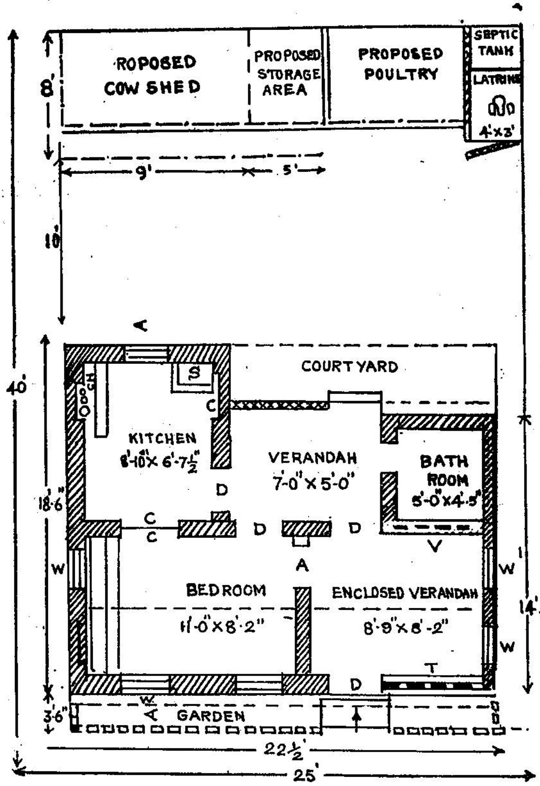


Fig. 53

Plot Area	:	1000 S. ft.
Plinth area	;	410.52 S. ft.

Plinth area with future addition

D.	Door	W.	Window	V.	Bamboo Ventilator
C.	Cupboard	CH.	Chula	T.	Trellis work in bamboo
A.	Arch	S.	Sink	......	Future addition

Sand

Sand used for building purposes shall be composed of hard silicious material. Sand is used for mortar, concrete, ordinary plaster, brick work or masonry.

Wood

Wood is comparatively inexpensive, strong, durable and easy to work. Wood is processed in a number of different ways, the simplest being to cut it into various shapes and sizes needed for structural purposes—joints, beams, planks etc.

Plywood is made of an odd number of wood piles or layers laminated with plastic resins under great heat and pressure. Plywood is used for doors, walls and decorative panelling.

Mainly wood is used for flooring, panelling, ceiling, roofing, columns, partitions, doors, windows and so on. Bamboo and timber are principle materials easily avilable for construction of rural low cost houses.

Leaves

Grass, palm leaves and palmyrah leaves are used for roof structures. They are temporary. They are highly inflammable and may harbour insects and worms.

Brick

Brick used for construction should be of best quality. It should be well burnt, free from cracks, regular in shape and uniform in size. Brick is used for walls and floors.

Cement

For the purpose of durability and strength cement should be used. It has the ability to bind together loose particles of gravel, broken stones or other aggregates.

Concrete is a building material made by mixing cement, sand, gravel and water to form a semi-fluid that becomes rock-hard when dry and set. It is fire proof, sturdy and can withstand high pressure. Various structures are moulded by concrete. Concrete should be mixed carefully to avoid cracks and leakage.

Tiles

Tiles used for house construction are of different types such as flooring tiles, roofing tiles, ridge tiles and marble tiles. Country tiles and Mangalore tiles are commonly used for roofing.

Floor tiles consist of terrazzo which are polished tiles made out of marble chips mixed with coloured sand; mosaic tiles which are cement tiles consisting of marble or ceramic chips and coloured mortar polished with a portable machine after laying; glazed ceramic tiles; clay tiles, venyle tiles, asphalt tiles and Rubber and cork tiles. Though some are expensive, they are easy to maintain and appear neat and decorative.

Metals

Iron, Aluminium and steel are metals commonly used in structures in flooring and roofing. Steel offers high strength construction.

Glass

Glass is made from sharp pointed grains of sand which become plastic or fluid if fused at high temperature. It is transparent and hence allows light in the interior. Glass is mainly used for partitions, windows, doors, and panes. With coated reflective glasses, vision in day light into the interior from outside is limited which helps to provide privacy.

Plastics

Plastics are synthetic materials used widely for small functional or decorative objects in the house as frames and builtin finishes

Asbestos

Asbestos is used for roof and partition walls. It is not advisable to use asbsestos as a roofing material especially in our country since they transmit heat.

While selecting, factors such as utility, ease of maintenance, durability, availability, ease of working and installing and cost of the building materials should be considered. Apart from these, family's taste and preferences, prestige, fashions and satisfaction must be the governing factors in the selection of building materials.

For economy in house construction and care bear in mind the following points:

Buy locally to avoid transportation charges.

Buy in large quantity to avoid the high cost of small deliveries.

Buy stock material in standard sizes.

Buy inexpensive materials when it will also do the job satisfactorily.

Never compromise on the quality of plumbing fixtures and fittings, light switches, pumps and other mechanical items subject to wear, paints etc.

Shop around to get the best out of the money spent.

Check the quality of independent articles and the performance characteristics.

Take advantage of sales and seasonal promotions.

Limit the number of different types of materials used for construction. This will reduce waste and saveon construction,

Assignment

Visit buildings under construction to study about the various materials used for building purposes. Do shopping survey to find the modern trends in floor coverings.

ROOMS IN THE HOUSE

Verandah

A verandah serves many purposes.

It is a place for a stranger or a visitor to wait.

It is a place for keeping shoes, walking sticks and umbrellas, a place to store vehicles. It provides place for business. The post man, the newspaper boy, milk man, the vendor call on the family members at the entrance. It serves as a passage to other rooms of the house. It is a place for sitting in the evening or at night after dinner enjoying light reading, or conversation with family members and neighbours. In small houses it is main sitting room. It protects the walls of the house from the direct sun rays. It is a place for pets and also a place for growing plants.

The back verandah serves different functions such as grinding, drying clothes etc.

A verandah more than 12 ft. wide is not economical. A verandah facing south or west is comfortable.

Living Room

(Drawing room parlour, lounge, hall). The living room should provide place for many of the family activities as reading, conversation, get together, indoor games and light music. It should be a place to receive friends and also to hold social functions.

In a small house it can serve as a study room for children, sleeping area for one or two members. It can be dining room

during special occasions. At times it can accommodate guests. Thus it may serve multi various functions, depending upon the type of the family.

A living room should express the spirit of the home to the family and of welcome to the friends of the family.

The living room should be well lighted and well ventilated and should provide maximum comfort for the family members. The living room should be situated on one side with an entrance from the front verandah.

The minimum size for a living room should be 15 ft. by 12 ft. The size of the door should be 3 ft. as minimum width and should be at one side of the wall. A coating of oil painting on tiles for a distance of 1 ft. from the floor is good from the sanitary point of view. The furniture and furnishing that are used in the living room must be comfortable and suitable for the room. For eg.,

for conversation — sofa, chairs

for hospitality — a centre coffee table

for reading — table. chairs, bookcase

for recreation — radio, records, table and modas

The living room should be simple in design. There should be enough wall space for hanging pictures and for display of decorative articles. Flower arrangements add beauty to the room. A shelf may be provided for art objects.

Bedroom

One spends more than 1/3 of his life time at rest in sleep here. It can provide place for dressing and storage of clothes,

Practically 15 × 12 ft. has been found to be a good size for a bedroom. A rectangular room is more convenient than a square one. No room should have less than 100 sq. ft. in floor area.

Ventilation is of utmost importance in bedroom. It should be on the side of the direction of prevailing wind.

The cot and matress in the bedroom should be comfortable. The door of the bedroom should be located in such a way that when opened the bed is not visible fully.

A small bathroom attached to a bedroom is a modern necessity. The light in the dressing area should fall on the person and not on the mirror.

Some storage space should be provided in the bedroom. Built-in cupboards for clothes and bed linen save space. A chest of drawers could also be provided. A small table and a chair may find a place to keep some of the books for light reading, a jug of water, flower arrangement etc.

It is better that parents have a separate master bedroom and children above ten years separate bedrooms.

Kitchen

Kitchen is aptly described as the homemakers workshop. It is the nerve centre of the house, place where we cook food, store our food, utensils and provisions. It can provide space for eating too. At times it provides area for creative activities. The comfort, health and happiness of the family is mainly dependent on the activities carried out in the kitchen.

Homemakers in India spend 70% of their time in the kitchen. Kitchen should never be suffocating chambers of pungent smoke irritating the eyes, nose, lungs and also the temper of the house wife. The modern flat houses pose some of the problem such as lack of space and uncomfortable arrangements. It is very essential that one gives enough thought to the kitchen arrangements.

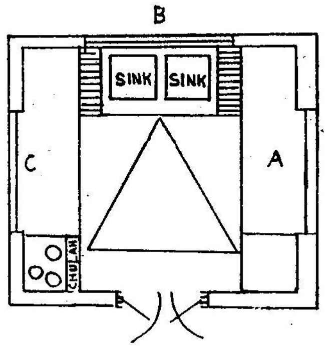


Fig. 54

Kitchen

A. Preparation centre B. Washing centre

C. Cooking centre

Location

The best location will be eastern or North-eastern corner of the house. This is helpful in having purified air and also warmth in the morning and coolness during the other part of the day.

Size and shape

For actual efficiency the kitchen should be neither too small nor too large. A rectangular kitchen is step saving. The size can vary 8′ × 11′ or 14′ × 18′.

Activities and work centres

The main activities in the kitchen are preparation, cooking and cleaning of food items and equipments. The work area for these three activities should be carefully planned. The kitchen should have the preparation, cooking centres adjoining each other at comfortable heights to form a triangle. This work triangle ensures convenience and safety.

The various shapes and in which the major work centres can be arranged are 'U' shaped, 'L' shaped, one wall and parallel corridor or two walls. The ideal shape for the kitchen arrangement is 'U'; it consists of preparation and cooking centres on either side and the cleaning centre in the middle. This is a compact arrangement and labour saving too.

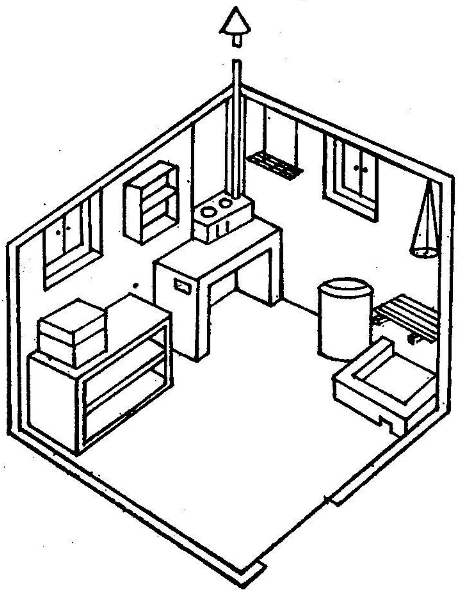


Fig. 55

Facilities provided in the kitchen

In the 'L' shaped kitchen arrangements the work centres are placed in two adjoining walls. The one wall arrangement is suitable for small kitchen.

Cooking centre

The range with the storage of utensils needed for cooking occupies an important place in the kitchen. A peg board for

frying pans and sauce pans, a holder for knives and spoons and all the food items and equipment must be placed within easy reach in the cooking centre.

Washing centre

Storing space for dish clothes, brushes can be hung in convenient place provided there. Sink should always be placed in front of a window. Garbage pail should be kept near or under the sink.

Preparation centre

Placement of a refrigerator in the preparation centre facilitates easy handling of vegetable, milk, egg and fruits during preparation. The equipment like blenders, beaters, sifters, sauce pans, measuring cups, spoons, knives, spatula should be stored here.

Height of the working centre

It can be 80 to 90 cms depending upon the height of the person working in the kitchen.

Storage facilities in the kitchen

Built-in cupboard or cupboard with drawers (closeable) and rack can be provided. Care should be taken to avoid insects. The wall area above and below the counter should be made full use of.

Bathroom

The purpose of a bathroom is to provide facilities for bathing, washing and dressing too. The main bathroom should be in the ground floor not far away from the main rooms. It can be attached to the bedroom for convenience. A bathroom with 5 × 6 ft. in size is necessary. If boiler is to be provided and washing to be carried out, the size may be 6 × 10 ft.

There should be good ventilation in the bathroom. A window at the usual level with frosted glass shutters admitting light but keeping privacy is good. A ventilator at the height of 6 feet above the ground level is helpful. Loft can be provided to store things if necessary. Small built-in shelf may be used for keeping oil, soap, brush, paste etc. The flooring finish should be easy to clean. It should never be slippery. The wall should have a polished surface to a height of 3 ft. from the floor. There should be good drainage facilities for waste water from the bathroom.

Water closet or Latrine

Water closet can be near the house or even inside the house (nowadays they can be flushed with water). The latrine on basket system is not sanitary. Earth closets can be used in rural areas. The minimum space needed is 3 × 4 ft. in width and length. Strictest privacy is required in these rooms in respect of sight and sound.

The lavatory should be kept clean. The basin should be cleaned daily with any reagent. The room should be washed with disinfectant like dettol. If bath section and water closet are combined more space is needed. The room may be equipped with minor wash basin, closed storage for toilet articles, a rack to keep clothes and towels, tub, mug etc. There should be tap connection for water. Facilities for shower bath add to the convenience and pleasure.

Assignment

Draw a floor plan of the living room. Observe the kitchen arrangements in your house. Give the important points you look for in your own planned kitchen.

One room apartment

The acute housing shortage and low income levels in India have compelled many to live in one room apartment. One room apartment or multipurpose room is a single room where all

activities of daily life are carried on such as living, sleeping, cooking, dining and studying. Hence enough thought should be given for the proper planning and use of one room apartment.

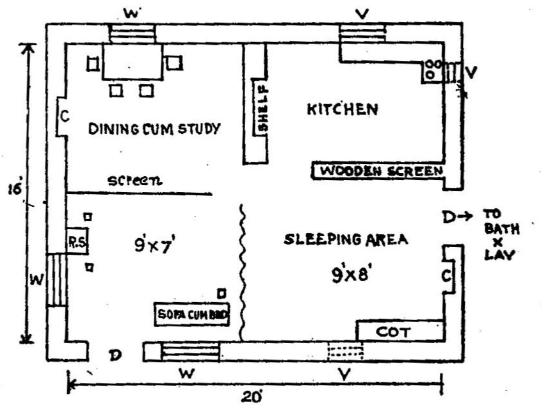


Fig. 56

One Room Apartment

The single room is divided into various areas as sleeping area, cooking area, dining area and so on. This division of areas is possible by means of room divider, screen and other type of partitions. Shelves kept in between the room divide the room into various areas as well forming storage units.

Furniture arrangement needs speical attention. There should be proper grouping of furniture for all activities; at the same time the room should have spacious effect. Dual purpose furniture as sofa cum bed, writing cum dining units, and similar modern multipurpose furniture should be used. Folding chairs, tables, movable modas, separable furniture units are helpful to keep the place compact.

The storage units should be properly arranged especially in the study, dining and cooking areas. There should be built-in cupboards and shelves in the wall area. Storage spaces can be

found beneath the windowsill, kitchen counter or below a radio stand or even a cot. Kitchen wall area needs careful plan.

Minimum furniture and other fittings carefully organise with good taste helps to remove the clustered effect of a one room apartment usually visualised.

Assignment

Design a storage unit for the kitchen and plan of a living room. Observe the kitchen arrangements in a house. Give the important points you look for in your own kitchen.

DECORATING THE HOME — INTERIOR DECORATION

Basic concepts in home decoration

Art is a man made expression of something beautiful. It must form an integral part of our daily life. Interior decoration is the creative art of selection and arrangement of furniture, furnishings and accessories to provide utility and beauty within the economic means of the family.

Importance of good taste

Good taste is the basis of interior decoration. It means a knowledge of and preferences for the first quality in any art. It must help us to do more beautifully the simple things of life as well as the unusual. Good taste simply means doing the right thing at the right time, in the right way at the right place. Some people are born with good taste. They have an eye for beauty and are capable of creating beauty in the selection and arrangement of all belongings. Good taste can be developed by practice, experience, skill and imagination.

A tastefully set up house is always beautiful, pleasant, interesting and satisfying with comfortable furniture arrange-

ment, gay furnishing, beautiful flower arrangement and interesting display of curios. The knowledge on elements and principles of designs will help one in developing good taste.

Elements of art

The elements of art include line, direction, shape, size, texture and colour.

Line

Line is the basic element of beauty. A line may be straight, slightly curved, deeply curved or zig zag.

Direction

Direction indicates the vertical, horizontal, oblique or diagonal position of the lines. In any arrangement an interesting distribution of line and direction is essential — the vertical lines for strength, the horizontal lines for repose, the diagonal lines for action and curved lines for gracefulness.

Shape

Square, circle, rectangle, diamond etc. shapes are formed by combining line and direction. Horizontal and vertical straight lines create square or rectangle.

Size

Size gives the dimension of objects. It may vary from small, smaller, smallest or large, larger or largest.

Texture

Texture indicates the fineness or smoothness of a material by which the object is made. They can be dull, shining, rough, soft, stiff, heavy, etc.

Colour

Colour brings out beauty to any expression of art. Colour can bring about warm or cool effect, light to dark effect, bright or dull effect in the objects and areas in the house.

Design

Design is defined as any arrangement of lines, direction, shape, size and texture to create beauty and order in an arrangement. It can be structural or decorative in an arrangement. It can be structural or decorative in effect.

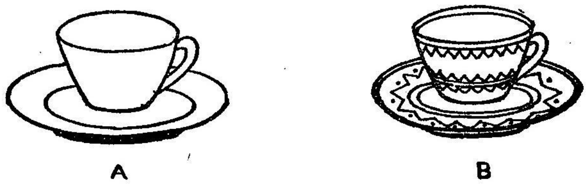


Fig. 57

Cups

A. Structural Design B. Decorative Design

Principles of design

The principles of design to create beauty are harmony, balance, proportion, rhythm and emphasis.

Harmony : Harmony is the art principle which produces an impression of unity or oneness. It is achieved by the selection and arrangement of consistent objects or ideas. The principle of harmony has aspects like harmony of line and shape, size, texture, colour and idea.

Balance: Balance is the art principle that produces a feeling of rest and contentment. It is obtained by grouping shapes and colours around a centre in such a way that there are equal attractions on either side of the centre.

Proportion: Proportion is the law of relationship. It means that space divisions are pleasingly related to one another within the unit, and to the whole arrangement of objects in the house.

Rhythm: Rhythm is the art principle that suggests easy connected movement along which the eye may travel from one end to another. It can be achieved by repeating shapes, having sizes in a progressive order and following continuous line movement.

Emphasis: Emphasis is the principle by which the eye is carried first to the most important point in any arrangement from the point the eye travels to other details in the order of importance. Emphasis can be created by grouping various objects, using decoration, having contrasting colours and using unusual size, shape, line and so on.

Assignment

Collect pictures where various principles of design are high lighted and discuss the salient features.

USE OF COLOUR IN INTERIOR DECORATION

Colour and colour combinations

The appeal of colour is universal. The very first impression of a house is largely based on the use of colour in the home. Colour speaks an emotional language to us. We think of colours as bright or depressing, pleasing or irritating and relating or exciting. Colour makes the house bright and cheerful. The colours used in the interior decoration of a house express the character, good taste and individuality of housewife.

Qualities or characteristic of colour

Colours have specific qualities or dimensions namely hue, value and intensity.

1. **Hue** indicates the warmth or coolness of colour. It suggests the definite name of the colour as red, yellow, green blue and orange. (See colour plate i at the end of the book.)

2. **Value** refers the lightness or darkness of a colour. White is the lightest colour having the highest value. Black is the darkest colour having the lowest value. A tint or lighter value is obtained by adding white to the colour; and a shade or darker value is obtained by adding black to the colour.

3. **Intensity or chroma** suggests the brightness or dullness of colour. A bright colour is said to be of full intensity. The intensity can be reduced by mixing grey with the colour or by mixing an opposite colour of the particular hue. (See colour plate ii at the end of the book.)

The colour wheel

According to the prang colour scheme, there are three basic colours—Red, Yellow and Blue. These colours are called primary colours or primaries because they cannot be obtained by any mixture of other colours, but they are the source of all other colours. (See colour plate iii at the end of the book.)

When two primary colours are mixed together in equal proportions, they produce another set of colours, known as secondary or binary colours.

Yellow + Blue = Green

Blue + Red = Violet

Red + Yellow = Orange

When one primary and the next binary colour are mixed the resulting colour is known as intermediate colour. There are six intermediate colours namely,

Yellow + Green	=	Yellow green
Blue + Green	=	Blue green
Blue + Violet	=	Blue violet
Red + Violet	=	Red violet
Red + Orange	=	Red orange
Yellow + Orange	=	Yellow orange

The three primary colours, the three secondary colours and the six intermediate colours can be arranged in the form of a circle like the numbers on a clock as shown in figure. (See colour plate iv at the end of the book.)

The colour wheel forms the basis of reference for colour combinations.

Warm and cool Hues

Imagine a band of spectrum colours brought around to form a circle, as shown in the outer circle of prang colour chart. Place yellow at the top in the centre; and violet will fall directly opposite on the same vertical line. The hues will fall into two large groups, one on either side of the vertical line. The colours at the right side of the colour wheel near the 'blues' are cool. Those on the left side around red and orange are warm, red and orange are the warmest colours, blue and blue violet are the coolest colours. Blue green is also cool.

It should be mentioned here that cool colours appear to recede or go back way from you. Warm colours advance or come towards you. The warm colours make the object

appear larger and nearer. Cool colours make the object appear small and far off. Warm colours are always cheerful and stimulating. Cool colours are restful and calm.

Neutral colours

Black, white and grey are neutral colours. Black results from the absence of light. A surface that absorbs all colours or light rays will appear black. White is a combination of all colours in light. A surface that reflects all colours equally will appear white. Grey results from the combination of two hues. Grey forms the centre of the colour wheel.

Colour combination or colour harmonies

Colour combinations which are beautiful, pleasing and satisfying give pleasure to the eye. We call these pleasing combinations as harmonious colour combinations. They produce an impression of unity. The standard colour harmonies may be divided into two main groups.

A. Harmonies of related colours.

B. Harmonies of contrasting colours.

Colour harmonies

A. Related colour harmony	B. Contrasting colour harmony
(1) Monochromatic colour harmony	1. Complementary colour harmony
(2) Analogous colour harmony	2. Double complementary colour harmony
	3. Split complementary harmony
	4. Triads.

A. Related Colour harmony

Harmony of related colours can be achieved through the use of monochromatic or analogous colours.

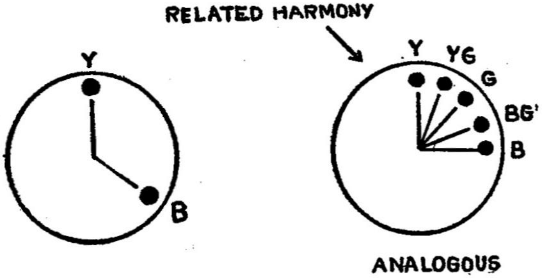


Fig. 58

1. Monochromatic harmony: It is known as one hue, one mode or one colour harmony. In this only one major hue is used. There may be difference in values and intensities of that particular colour (e.g.) blue alone or blue with light or dark value.

Monochromatic colour harmony is always safe to use in a room or in a dress. It is beautiful in a small area. It will be restful if values and intensities of a colour are handled expertly.

2. Analogous colour combination: It is achieved by using colours which lie next to each other on the colour wheel. Actually it is combination of colours between two primary colours including one primary and the related colours of that primary (e.g.) yellow, yellow green, green, blue green. Blue is not included since it is an entirely new primary.

B. Contrasting colour harmony

This can be obtained by the following ways.

1. Complementary harmony: Any two colours that are opposite to each other on the colour wheel are called

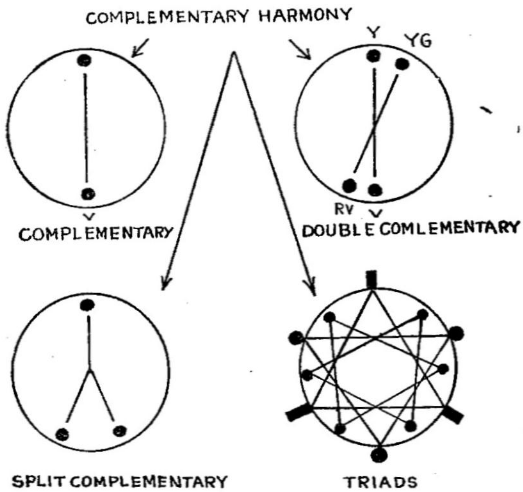


Fig. 59

complementary colours. Complementary colour harmony is obtained by combining directly opposite colours. Complementary colour harmony is interesting and pleasing if used artistically. When complementary scheme is used in a room display of one or two colours should be used at full intensity and limited to small area.

(eg.) Yellow — Violet

Blue — Orange

Red — Green

or

Yellow green — Red violet and so on.

2. Double complementary harmony: Two adjacent colours on the colour wheel and their complementary colours together form double complementary harmony (e.g.) yellow and yellow green with violet and red violet. When this combination is used one colour can be outstanding and others moderately used.

3. Split complementary harmony: It is obtained when a primary or an intermediate colour is combined with the colours on either side of the opposite colour (e.g.), yellow with red violet and blue violet, yellow orange with violet and blue.

As with all colour schemes, one of the three is selected to be the main colour and the other two are used to accent it.

4. Triad scheme: The triad scheme is made up of any three colours that are at equal distances from each other on the colour wheel—forming a triangle. Thus one can get four triads.

Primary triad — Red, blue, yellow

Secondary triad — Green, orange, violet

Intermediate triads — (i) Yellow orange, Blue green and Red violet

(ii) Yellow green, Blue violet and Red orange.

Neutral harmony is the combination of any hue with the neutral colours such as black, white and grey.

The skilful use of colour is the best way of keeping the individuality in a room. Experience, intiative, imagination, interest and knowledge about colour harmonies will guide in the planning of colour schemes in the house.

Use of colour in interior decoration

Colour can transform darkness into lightness, dullness into brightness, gloominess into cheerfulness and darkness into beauty. The home is a place where colours can be used in various areas—floors, walls, ceiling, furniture and furnishings and other accessories. The selection and use of colour in the house expresses the character and taste of the family members.

There are various factors that must be taken into consideration when planning a colour scheme for a room. They should be based on (1) the characteristics of the colour, (2) the purpose of the room, (3) size and proportion of the room, (4) the lighting effect in the room and (5) the relationship of one room to the other.

(1) Different colours have different characteristics and produce special effects to the onlookers. Red, yellow and orange are warm, bright and stimulating. Green is cool and is calm to the eyes. Blue and blue green are restful and cool. Violet is majestic. Pink is considered as feminine colour. White is a symbol of purity and brightness.

(2) The colours in a room must be suitable to the purpose for which the room is intended to be used. At the same time the colours must express the interests and personalities of those who will use the room. The living room colours should be comfortable in order to create a welcome atmosphere for visitors and provide ease for the family members. Blue, green, pink, yellow—all in lighter values, greyed tones can be used in this room. A bedroom is a place of rest and relaxation. Hence quiet colours such as blue or blue green should be used. The dining room must have cool and restful colours which at the same time stimulate the enjoyment of eating food. Families of green with accents of red or orange are suitable. The kitchen should be painted with white or any gay colour which will break the monotony of cooking. If smoke is a problem use blue grey or smoky green to the kitchen. The bathroom can have fresh, clean stimulating cream, white, pink or turquoise (light blue green).

(3) If a room is full of bright sunlight, one can use cool colours. A room that receives little sunlight can have bright colours such as yellow and white. Cool colours are suitable for houses in the hot climates.

(4) A small room can be made to appear larger if light or cool colours are used on walls. The same way a large room will appear smaller with warm colours or dark colours. Different colours used on the walls of one room will also make the room

look small. A ceiling that is too high can be made to appear lower if it is painted with darker or warmer colour than the walls. It is usually desirable to make the walls lighter than the floor, and the ceiling lighter than the walls. A square room appears different in shape with contrasting colours on the wall. Colours can change the appearance of the room depending upon its use.

(5) The colours used in one room should be harmonious in itself and also in relation to the other room colour in the house. There should be a feeling of unity as one passes from one room into another.

Assignment

Draw a prag colour chart. Observe the colour combinations used in your dress. Visit a modern home, and examine the colour scheme — suggest modifications with reasons. Paint greeting cards using various colour combinations.

ARTICLE OF FURNISHING AND DECORATION FOR THE HOUSE

Furniture—Selection and Arrangement

Furniture are pieces intended for comfort, rest and relaxation, storage of articles and beauty. Furniture form an indispensable item in all houses to provide a harmonious family living. A list of furniture at home will include table, chair, cot, dining table, book shelf, chest of drawers, teapoys, show cases, etc. They are made of different materials like wood, steel, plastic and upholstered.

While selecting furniture the following points are to be remembered :

The furniture should have utility (eg.) a table for writing, a cot for sleeping, a shelf for storing, dining table for dining, chair for sitting and so on.

Furniture must provide comfort for the user while using.

The furniture should be well constructed. i.e. the joints properly fitted, the edges smooth and with a good finish.

The furniture must be firm and not shaky.

The design may be simple, but at the same time beautiful and fashionable.

It should be durable, easy to maintain, and transportable.

The design must be suitable for the purpose, place and members using.

The size of the room and colour scheme of the room is an essential point to consider. The furniture design must worth its cost. The kind of materials used for construction, the shape, the style, the colour are all elements to look for in furniture selection.

The furniture in a room always reflect the personality of the members and the status of the members. Hence it is essential to give due care while buying the furniture.

It is good to buy from a well established firm. Before buying compare prices, quality, guarantee, the payment plans and the facilities available for transporting and fitting it in the house.

Arrangement of furniture

While arranging furniture the utility, suitability and principles of harmony, rhythm, emphasis, balance and proportion should be taken into consideration.

The general rules for furniture arrangement are:

1. Select a centre of interest and subordinate all other interests to it.

2. Observe balance in arrangement. Formal balance gives a dignified, restful effect, but too much of formal balance in one room is monotonous.

3. Retain good proportion while arranging. Place all large pieces on large wall area and small pieces on small wall area.

4. Place large pieces always parallel to the structural line of the room.

5. Avoid using too many furniture in a room.

6. Scatter upholstered pieces among wooden pieces.

7. Avoid letting all furniture hiding the walls. But at the same time avoid filling too much of the centre floor area. Keep the traffic lines in the rooms very clean while arranging.

8. Fix the position of the large pieces of furniture such as sofa set, cot, chest of drawers and so on before trying to place small pieces.

9. Arrange all furniture with purpose and function in mind, grouping those which are needed for a particular activity in one place.

Comfort and convenience should be coupled with beauty and utility in furniture arrangement.

Curtains, draperies

The decoration of windows and doors is one way where a small outlay, a little time and imagination can pay high dividends. Curtains and draperies are used in home beautification.

Curtains and draperies are used to regulate light, heat, wind, lessen noise, provide privacy, divide space, and beautify the house.

Curtains of various materials such as cotton, nylon, silk, plastic are available in the market. Curtains are used on windows and doorways. The manner in which they are hung add charm and dignity to the rooms.

While selecting curtains, it is essential to look for the purpose for which it is intended, viz.,

the colour of the room as well as other furnishing materials, the size of the room, doors or windows.

the decorative effect one wants to create in the room.

the type of material, the colour, thickness, texture and design and the washability, durability, colour fastness and cost.

It is better to choose materials having prints on both the sides. For large rooms curtain can have large designs and vice versa. Plain fabrics or fabrics with geometric designs, abstract designs and conventional designs are good for curtains.

Dark and gloomy rooms can become brighter by using light coloured materials, cool colours give a cool, restful effect to the room and warm colours add warmth and cheer to the room.

Horizontal lines in the material add width to the narrow window and vertical lines make it look higher or longer. The width of the fabric should be 2, 2 1/2 or even 3 times than the width of window to have a fully draped effect.

While hanging curtains and draperies various styles can be adopted. It can extend to a length of the window sill, cover the apron (wood work under the sill) or come upto the floor. Room with a low ceiling appear higher if draperies are used from ceiling to floor and have lighter colour dimensions. Curtain rods, strings and rings are helpful to have a good hang. The finished edge of the curtain tops can be covered by decorative treatments such as valence (piece of fabric) or cornices (solid wood or metal). The valance or cornice can be plain, pleated, ruffed, swagged or shapped to any pattern.

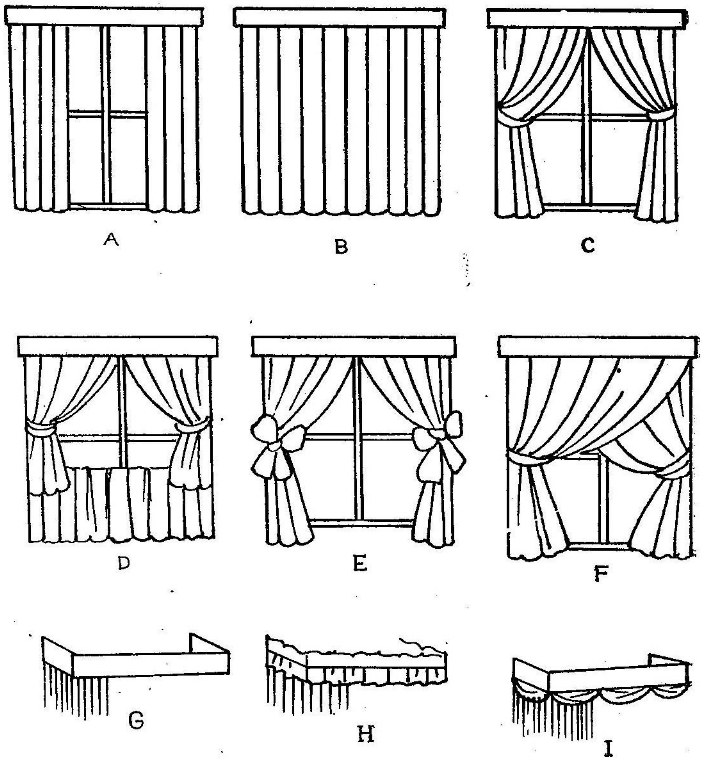


Fig. 60

Various Styles in Window treatments

Floor coverings and floor decorations

There are many types of floor coverings available today.

Hard floor coverings include wood, stone, marble, slate, brick, tile and concrete.

Resilient floor coverings are smooth surface materials like asphalt tile, rubber tile, vinyles, cork and varieties of linoleum.

Soft floor coverings are carpets and rags which represent the major house furnishing.

Selection of floor coverings is based on function, wear, cost, design and the effect of covering on the overall decoration. Fibre matting from coconut fibres or sisal is inexpensive.

Carpets and Rugs

Carpets and rugs contribute much to the well being and happiness of every member of the family. They make the home attractive, cozy and livable. Carpets and rugs are the foundation for the decoration of the floor by its colour, texture and design. There are many functional values attributed to carpets and rugs. Carpets will prevent the floor surface noise (footsteps, sound of droped objects, impact noises from floor to floor) and shock. They add warmth to the room. With the qualities of quietness and soft textured nature, carpets and rugs suggest calmness, ease and comfort. Carpets on floor especially provide sure footing and prevents slipping. They give the room a finished clean majestic luxurious look. Carpets and rugs establish the colour scheme of the room.

The fibres mostly used in carpets today are wool, nylon, acrylic, polyster and to a lesser degree cotton and rayon; wool and nylon with cotton blend is common. Carpets come by bulk and to varying sizes to cover the full area of the floor. Rugs are made or cut to standard sizes and are usually not fastened fully over the floor.

When one selects carpets it is essential to look for colour, cost, character of the room, purpose (decorative or background), durability, quality (weight of pile, dareness of pile, backing used), upkeep and care, design, utility, resilency, abrasiveness and so on.

Proper care of floor covering is essential to maintain the fresh nature of the floor coverings.

Floor decoration

Kolam : Kolam is a free hand drawing of various indigenous designs. It can be dotted or lines. For drawing kolam, either white stone or chalk powder, white or coloured sand or powders and solution prepared by mixing rice flour with water is used. Red mud solution is used as painting to give added brightness at borders or centres of interest. On special occasion, cowdung smear is applied as base on floors before putting Kolam.

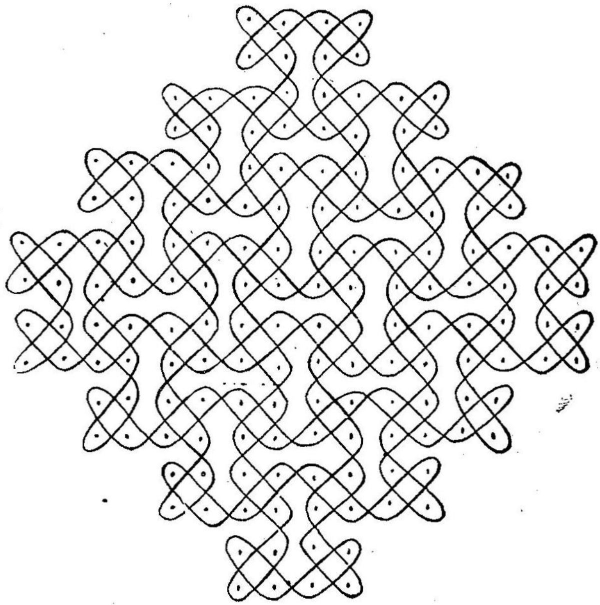


Fig. 61-A

Tamilnadu style kolam

Rangoli : Rangoli is designed on a pattern which has been previously drawn on floors. Coloured dry powders which are usually made from rice flour are used. The rice flour is mixed with different colours and used for different parts of the design.

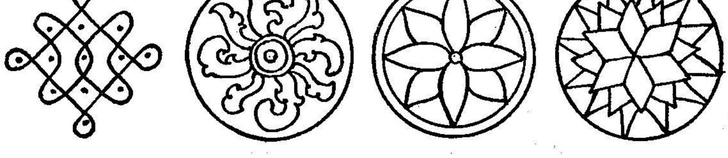
Alpana : Alpana is a traditional art where the design is painted with white paint. Usually zinc oxide and gum is mixed to keep it for a longer duration.



Fig. 62-B

Bengal style Alpana kolam

Flower carpet : Flower carpet is one where the design is neatly drawn on the floor previously. Different coloured flowers, petals and leaves are arranged over the design artistically. Wet sand may be evenly spread beneath the flower carpet to have a firm holding.



Kolam Rangoli Alpana Flower carpet

Fig. 63-C

Simple designs

Lights

Natural sunlight has a cheerful and happy effect on everybody in the home. Gas light, candle, oil lamps can be used for artifical lighting but electric light is welcomed by all. Fluorescent tubes are better than filament bulb. Careful choice and placement of light in a room adds to the attractive appearance of the home. If an electric light is unshaded the direct light can cause dark shadows or glare light. If shadowed or reflected on the ceiling it will be less dazzling and more restful A balance between direct and indirect lighting gives the best satisfying effect.

Good lighting means an even, diffused light throughout the rooms as well as direct although not exposed lighting for concentrated work.

Besides a central light in a room, local lighting as table lamps, dining table spot lamps, bedside lamp or work spot lights near stove etc. are needed.

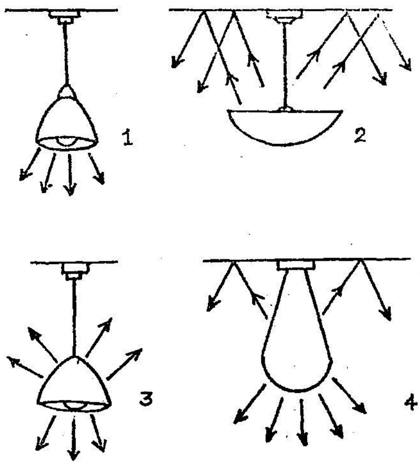


Fig. 64

Types of lighting

1. Direct 2. Indirect 3. Semi direct
4. Semi indirect

The lamp add much to the decorative value of the room. It can be the centre of interest in the room and can emphasise the

beautiful aspects in the room. It should fit into the colour scheme of the room. The shade should also preserve the function of lighting.

Adequate lighting

- makes tasks anywhere in the home easier to do.
- reduces eye strain and provides more comfortable working conditions for working after dark.
- has flexibility in having right light in the right place.
- adds glamour and charm to the everyday scene of home-living.

Light is most important when one enters the room, closet, stair area, verandah, corridor, garage or garden especially for convenience and safety apart from beauty.

Pictures

Pictures are integral part of wall decoration. Pictures reveal the stage or aesthetic development of their owners more clearly than any other articles of furnishing. They make their appeal in various ways-through beauty in form, colour, pattern, subject matter, having the power to stir the imagination. They can and often establish the mood or theme of a room.

The various types of pictures are — landscape, seascape, still life, architectural portraits, photographs, religious, abstract modern pictures.

Selection of pictures

The selection of pictures should be based on the subject matter appeal, aesthetic appeal, the quality, availability, the cost and the personal taste of the members. The background effect of the wall, the space, the colour scheme of the room must also be considered. The pictures selected must coincide with the idea of the room. Pictures for the **living room** should

be of general interest. It should not be too unusual in composition, colour or subject matter because the room should be restful, and the pictures there in should not be offensive to friends or to any member of the family. Suitable living room pictures are landscapes, marine life, flowers, figure compositions and portraits.

Dining room : Dining room pictures may be brighter because the occupants do not stay there long They can have themes which will enhance the appetite. Paintings of flowers, still life and landscape are suitable.

Children's room : Children's room should have pictures that interest children and also have aesthetic merit. They should be colourful and gay. Pictures of babies, animals, natural life, automobiles, places etc. are appropriate. They should be large enough to be seen easily and should be hung at the eyelevel of children. Pictures should be changed as the children grow and learn to appreciate better ones.

Study room : The study room pictures should be of educational character, and not divert the concentration needed for studies. They should favour studies, boost up clear and original thinking. Pictures of scientists, great men of the nation, invention etc. may find a place.

Bed room : Bed room is a personal room. It can have pictures and photographs of personal taste, since it is a place of rest and intimacy.

The religious pictures that implies worship requires a special setting, for it would obviously be out of place in a social room. Hence they are placed in the more personal rooms of the house or pooja room. But if the religious pictures are a sincere expression of the life of the family, then it may be hung in the living room.

Hanging of pictures

Hanging pictures properly is an art in itself. Pictures should be hung in such a way that the centre of interest comes at about the eye level.

They should be hung flat against the wall and not tipped forward. If unavoidable, do not use visible wires.

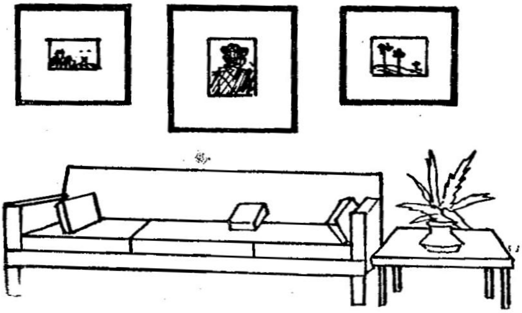


Fig. 65

Hanging of Pictures

It is desirable to have the lower or upper edges of all pictures in a room at the same distance from floor. If the pictures are grouped over furniture or builtins of different heights, the top edges of frames should be in straight line. The same way, the bottom edges of the frames should be of straight line if arranged over a sofa or couch. Incidentally the space between the pictures in a group should be less than the width of any one of the picture.

Light pictures are best hung on fairly light walls and dark pictures on dark walls or in dark corners.

For shape harmony, tall pictures should be hung in vertical wall spaces and broad pictures in horizontal space.

Small pictures are out of place on large wall spaces. Proportion is an important consideration while hanging pictures. Pictures are interestingly hung in groups with harmonious themes.

The principle of emphasis plays an important part. There must be plain space around the pictures for thorough enjoyment of picture by the onlooker. Colour appeal of the picture will add to the brightness.

Rhythm must also be considered while arranging pictures. Pictures possessing line movement should be so placed that their lines carry the eye towards it and not away from it.

Other Accessories

A room may be decorated in the best of taste with well designed furniture, beautiful furnishings and have a harmonious colour scheme. But it cannot and will never show individuality or real interest unless it is furnished with the kind of tasteful accessories.

Accessories are small art objects helpful in completing the interior decoration. It contributes much to the liveable and comfortable atmosphere of a home. They enhance the beauty of the room. They serve as a means of self expression, originality and personality of the home maker. They may be classified as functional (e.g.) ash tray, paper weight, book ends, time piece, pin tray, pen holder etc. and decorative accessories (e.g.) carving, pictures, ornamental objects, flower arrangements, etc.

A list of accessories available for interior decoration includes :

pictures	sculptures	book ends	smoking
books	gifts	paper weight	accessories
clocks	figures of ducks,	slip covers	feathers
mirrors	fish, animals	wall hanging	stones
lamps	candle sticks	flower vases	corals
lamp shades	and candles	bowls	egg shell
screens	glasses	metal objects	fibres
		curios	twigs
		porcelain	beads

While selecting accessories the following points are to be noted :

The articles should be good in design so that they enrich the interest of the room.

They should be beautiful so that they add to the charm of the room.

There should be only a limited number of accessories in one room so that they never form a mass in the house. It is not advisable to crowd a number of articles in a room, however beautiful they may be for comfort and convenience.

The objects should serve a purpose of utility so that it is never felt as a wasteful item for the money spent.

They should be economical in the way that they do not loose charm within a short period, not easily broken, and never form a burden to the home maker to maintain it.

Colour is an important factor in the selection of accessories.

It is better to have a setting for the accessories, tables, wall areas, built in show cases, stands, shelves, book shelfs etc., as fitting places for them. The principles of design such as balance, rhythm, harmony, emphasis and proportion are applicable to the arrangement of accessories.

Regular cleanliness and care is essential to maintain the attraction, individuality and life of accessories.

Use of plants and flowers

There is nothing so beautiful, attractive, elegant and colourful as fresh flowers. If skilfully arranged they add glamour and charm to the interiors.

Flower arrangment is an art by itself. Its purpose is to add cheer, life and beauty to the surroundings. They provide a centre of interest in the home. The psychological satisfaction one receives from the aesthetic appeal of flowers and the artistic arrangement cannot be undermined,

The articles required for flower arrangement are vases, holders, scissors, twigs, leaves, flowers, water and other accessories.

Steps in flower arrangement

1. Understanding the area for arrangement

It is very essential to note the place, the room, colour scheme, background of the room, the purpose, etc. before

arranging. Flower arrangements are usually kept on tables, shelfs, room corners, dressing table and window sills. It is suitable in any area especially the living room, bedroom, dining hall and verandah or reception.

2. Collecting flowers

Proper selection of flowers is the basis of successful flower arrangement. The stems should be out long for desired size. It is better to select blooming flowers either at dawn or at dusk time. Stems should be cut with a clean sharp knife or scissors in a slanting manner and never be broken with hand. As soon as they are plucked, immerse the stem in water after removing the dry leaves.

3. Selecting vases and collecting other equipment

Vases and holders help to support flower and foliage. The usual type of containers are trays, cylinders, narrow necked vases, dishes, plate. They may be of suitable sizes and shapes and made of materials such as brass, wood, glass, china mud or plastic. Indigenous materials like clay moulds, coconut shell, bottles, tins, baskets can be used as containers. The usitable colours are white, green, cream, brown and earth colour. Delicate soft flowers need fine vases.

The other items necessary for arrangement like suitable pin holders or meshed wires, scissors, twigs, twine, wire, water, preservative etc. can be collected at one place to facilitate arrangement.

4. Having an idea about the arrangement

There are various types of arrangement. Any suitable design can be chosen to suit the room, the area and the purpose.

The general points to keep in mind while arranging flowers are:

Have a centre of interest.

Arrange the flowers first and then fill up with leaves and twigs.

Have big bright flowers at the bottom and small light coloured flowers on higher levels.

Make the levels start and deviate from one point in the arrangement.

Fill the flower vase with enough water to dip the stem ends.

Sprinkle salt, sugar or suitable preservative to keep up the freshness of flower for long.

Display the flower arrangement beautifully in a place to be seen and enjoyed. Select suitable accessories to go in with the arrangement.

All the principles of design should be followed for pleasing effects.

Types of flower arrangements

1. Mass arrangement

A group of flowers of all kinds, colours, sizes and textures are combined in a container. This is traditional in style and the formal effect is a mass. Usually a decorative container is used.

2. Line arrangement

A line arrangement emphasises the lines and is simple, meaningful, beautiful and informal. The Japanese oriental style usually follows this arrangement. The arrangement gives an impression of natural, free growing plant. Odd numbers of flowers are used at three levels. The highest level signifying heaven. the middle referring the man, and the lowest indicating the earth, (Heaven - 1 1/2 times the height or width of vase; Man- 2/3 the height of heaven; and Earth - 1/3 the height of heaven).

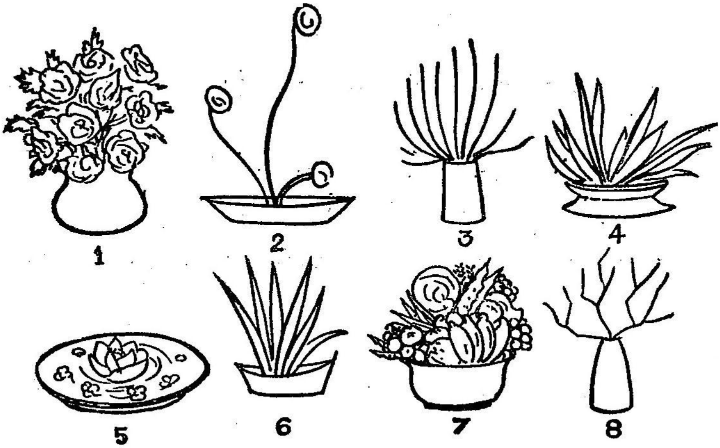


Fig. 66

Types of Flower Arrangements

1. Mass 2. Line 3, 4 Line & Mass
5. Floating 6. Foliage 7. Fruits & Vegetables 8. Dry

3. A combination of line and mass

The mass and line combination gives rise to geometric shapes as cone, crescent, circle, triangle, 'L' shape and so on.

4, Foliage arrangement

Arrangements using leaves or branches of plants are foliage arrangements (e.g.) ferns, crotons, cannas, cactus, weeds can also be arranged effectively with a touch of imagination.

5. Dry arrangement

Dry arrangements last for longer. Drift wood, dried seeds, flowers, leaves, pods, egg shells, thorns, beeds, palmflowers, cottons, corns, feather etc. find a very pleasing effect. Artificial flowers of beauty can be combined.

6. Fruits and vegetable arrangement

It is done by using fresh fruits, and vegetables to depict beautiful shapes and designs.

7. Floating arrangement

It is arranged with flowers whose stems are cut short. The largest or the brightest flower floats in the centre and the other around it. This creates an impression of natural flowers in pond.

8. Dimunitive arrangements

They are small arrangement usually within four inches in height arranged in small containers like egg shell, small bottles, thromble, lids etc.

Plants arrangements

Apart from flowers, plants also find a place in any part of the house as a decorative piece. They add natural charm, fresh note and dignity in the house.

Potted plants can be put on the corners of a room, teapoy, book shelf, window sills and on walls. It can be grown in special brackets fitted on the wall.

Various types of plants are available. Money plant, ferns, cactus, palms and christmas trees are common. Plants kept in a room should always harmonise with the decoration of the room in wnich they are kept.

Big bold potted plants should be used for major effects in room corners or at the entrance. Small tiny pots must be kept on coffee table, shelves and small window sills. They require proper care to obtain good results.

Assignment

Observe and evaluate the furniture arrangement in the different rooms of a well decorated house. Collect as a class various types of pictures and suggest suitable areas. Carryout a project in the Home Science Laboratory, decorate the windows and evaluate the effect.

List the various art objects that can be used for interior decoration in your house.

Arrange an exhibition where the class show the talents in floor decoration.

Prepare art objects which can be used for wall decoration.

Visit electric shops for knowing the trends in lighting fixtures and shades.

Try to keep flowers arrangements during function on the guest table in your school.

Maintain the flower garden of your school and help the gardener in planning.

HOUSEHOLD CLEANING AND MAINTENANCE

'Sanitation is a way of life' It is a quality of living expressed from within. It begins with individual in the house and spreads to the community in which one lives, contributing towards public health.

The term cleanliness may mean freedom from dust or dirt. The general cleaning is achieved by

(i) **Washing:** It helps to dissolve soluble substances and remove dirt (e.g.) floor, bed covers.

(ii) **Beating and shaking**—It brings the ingrained dust to the surface and out of articles (e g) carpets, bedding.

(iii) **Sweeping**—It is useful for removing the dirt (e.g.) floor.

(iv) **Dusting and polishing**—It gathers dust in a cloth or mop which can be washed or shaken after use. Polishing furniture and floors with polish will also preserve the wood. Friction is responsible for removing the dirt.

(v) **Suction:** The method of gathering dust into a bag or container by means of suction with a vaccum cleaner is the most modern way of removing loose or ingrained dirt and dust from floors, carpets and furnishing fabrics.

A clean house—

makes the homemaker proud of her home.

makes the family feel good.

helps to keep the family healthy.

helps things last longer.

sets a good example for children.

helps the neighbours have respect for the family and gives satisfaction and enjoyment to children and other friends.

Characteristics of a clean house

A clean house has

floors with no dirt, garbage, grease or trash on them.
walls and ceiling without cobwebs or dust.
furniture without dust, crumbs or grease.
beds that are made up with clean bedding or bedding and mats stored neatly.
clothes washed, ironed and put away.
duster washed and put away after each meal.
foods—in all form covered and stored properly.
kitchen equipments without grease—sparkling and clean.
toilet—clean inside or outside the home.
the yards and porch well maintained and neat.
no pets walking inside the rooms.
no bugs or flies or other pests in the household.
no trash in the interior or exterior of the house.

Maintaining a well kept house—The cleaning routine

All parts of the house inside and outside should have constant care and attention. Some cleaning jobs need to be done daily as a routine, some need to be done once in a week, and others only periodically. The amount of work involved in keeping a house clean and tidy depends largely on the way it is planned and equipped.

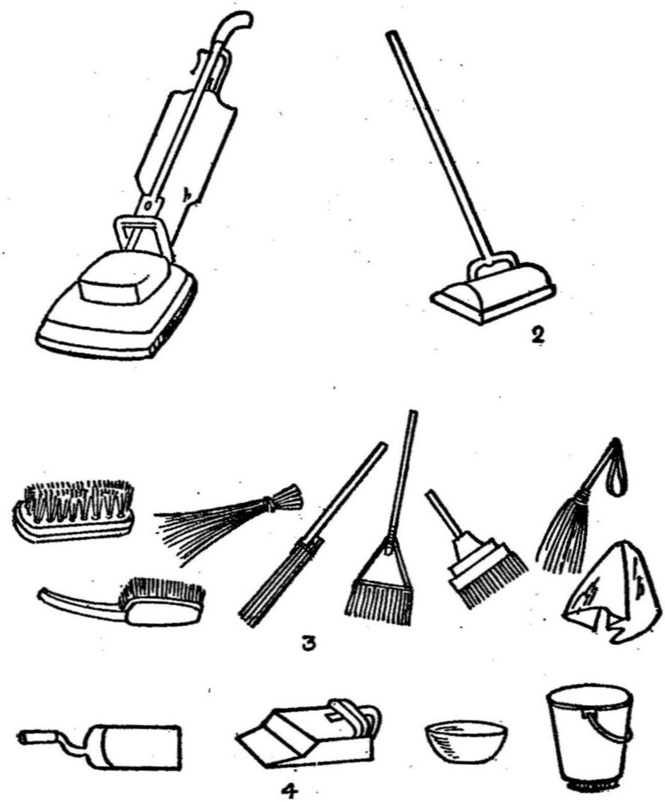


Fig. 67

Household cleaning tools

1. Vacuum cleaner
2. Carpet sweeper
3. Brushes, Brooms & Dusters
4. Bucket, Pail, etc.

Tools for cleaning

A strong step ladder.

A long handled cobweb remover.

Strong brushes and brooms for floors, carpets, mats and rugs.

Brushes for upholstered furniture.

Brushes for bathrooms and lavatory.

Dusters.

Mops.

Polishing clothes.

Scrubbing pail.

Carpet beater.

Vessels, pails and buckets.

Materials for cleaning

House hold Ammonia.

Kerosene.

Strong and mild soap.

Disinfectants.

Cleaning abrasires.

Metal polishes.

Furniture wax and polish.

Floor polish.

(i) Daily cleaning schedule

It is always easier to keep things clean by regular attention than to clean them when they become really dirty.

General order of work

Open windows and air rooms.

Tidy rooms.

Dust and mop the surroundings.

Dust furniture, mirrors, windows.

Empty and wash ash trays and empty waste baskets.

Replace everything neatly.

Arrange magazines and papers.

Water plants in the interior or arrange fresh flowers.

Clean the traffic areas on rugs in the living room, clean the utensils and wash floor in the kitchen, roll mattress, or make beds in the bedroom, clean bath fittings, flush and brush the lavatory pan and check the open drains and remove obstructions if any in the drainage.

(ii) Weekly cleaning schedule

The homemaker can give the house and its belongings a more complete cleaning at intervals.

General order of work

Kitchen—clean shelves, stoves, food safe, floor and polish utensils.

Bedroom—Air mattresses, mats, pillows and beddings, change linen, clean out almyrahs and cupboards.

Bathroom—clean out shelves, soap dish and cloth racks and boiler.

Dining room—wash table sheets, polish ornamental objects, change cushion covers, clean shelves, clean sink.

General points: Polishing mirrors, metal objects, furniture, dusting lamp shades, wiping pictures, bulbs and light fittings, brushing upholdstered furniture, removing cobwebs, cleaning rugs and washing glass accessories should form the part of weekly cleaning.

(iii) Periodical cleaning schedule

Clean draperies and hangings, put away seasonal clothes, rearrange furniture, clean thoroughly each room, give special care to builtins, shelves, cabinets and meat safe, check and do repairs in furniture, ceiling, wall and floor areas, do renovations and redecorations if necessary. White washing and repairing can be done periodically for proper maintenance.

(iv) Spring cleaning schedule

In a thorough, well run home where thorough daily and weekly cleaning is done, nothing superfluous is permitted. But still it is better that once a year the whole house is given a thorough cleaning confining to one room at a time. Repairs and renovations of the room may be noted down and taken care of simultaneously. White washing and painting must be undertaken.

Method of cleaning rooms

Take down all curtains.

Remove ornamental objects, books, pictures etc.

Turn down the whole contents of drawers, shelves, cupboard and attick. Take care of the chimneys. Clean them well, dust, sun and polish and return. Clean rugs, carpets, heavy curtains and draperies, upholstered furniture —Lift and give attention to both side of each article.

Place these articles outdoor to air them.

Dust walls and ceilings with clean brushes or mops; wash floors and allow them to dry.

Attend to the cleaning of accessories.

Clean windows, replace carpets, polish furniture and fittings.

General repairs

A house needs constant checking and repairs to avoid having to make major repairs or discard certain items even. It is important not to postpone even minor repairs.

Constructional defects include leakage, small holes or cracks in the floor or wall, broken tiles, loose fittings of wash, basins, projecting or loose knobs, waving window panes or doors, loose window sash etc.

Furniture and furnishing defects : Squaking of furniture holes, dents and cracks in the furniture, chipping of polishes, stains; defective painting and varnishing, broken parts of furniture, adjusting hinges etc. protruding upholstering, torn upholstering and furnishing material.

Electrical : Wires, replacing plugs, defective lamp sockets, defective appliance plugs, fuse, electric switch defects, radio repairs, fitted mechanical gadgets repair, replacing an electrical cord etc.

Plumbing : Leaks in pipes; fausets, washer, corrosion, sealing or detrioration of paint, varnishes, enamel etc., stains, leaking flush tanks; rusty or corroded pipes, elimination of sewage gas, plumbing system leaks in tanks, relieving a blocked drain etc.

Cleaning the various parts of the house

Cleaning of walls

To clean walls use a broom with a cloth tied around it or a long handled brush.

Dust down the walls and remove cobweb.

Now and then, wash the walls all over.

Repair cracks or holes in the walls or the damages caused by termite as soon as it is noticed.

Repaint or white wash to freshen them.

Remove finger prints, grease spots or stain by using a clean wet rag with little soap.

Tiled walls — Wipe or wash with warm soapy water.

Painted walls — Wash with soapy water taking small sections at a time cleaning with vertical strokes. Soda is liable to change the colour of paint.

White washed walls and Distempered walls — Wash occasionally with cold water. If very dirty, add little soda and lime. Distemper will come off in parts if glue is not mixed in the original water.

Papered walls — Sweep with soft broom and clean with bread crumbs. Do not wash it unless they are glazed.

Cleaning of floors

Floors must be swept daily, dusted or scrubbed everyday depending on the kind of material they are made of.

Earth floor: Keep it dry always. Plaster any cracks. Smearing cowdung is a common practice in our homes. If washed, water should not be allowed to seep through the floor.

Concrete floors: Sweep daily. Scrub and wash away grease spots and stains. Use hard brush and soap and water for cleaning.

Wood floor: Sweep and dust with a dry mop daily. Wipe off any stains spilled over it, immediately.

Linoleum floor: Wash with a mop or cloth using warm water with soap powder or soap. Rinse and allow to dry.

Tiled floors: Sweep and wash everyday. Red tile floors are difficult to maintain clean since every foot mark is visible. Wipe tw or three times if the floor is used often.

Marble: Wash with soapy water. Rub with soap and water or use lime juice to remove stains.

Cleaning the different articles and utensils in the house

Mirror

Dust glass and frame separately.

Rub with a pad of tissue paper daily.

Cleaning can be done also by

(i) rubbing with a cloth dipped in methylated spirit

(ii) using a paste of whiting (white chalk powder) with spirit

(iii) rubbing with chamois leather dipped in water and vinegar.

Take care to see that while cleaning it does not penetrate behind the frame.

It is necessary to polish after cleaning with fine dry cloth,

Pictures

Dust all pictures daily with a soft brush or a clean duster.

Brush the cords weekly and raise the picture from the wall to dust the back.

Dust frames well.

Clean the glass with methylated spirit. If not use a well wrung moistened leather.

On no account moisture should be allowed to penetrate behind a picture.

Wooden articles

Wooden articles may be plain, polished, oiled, waxed, varnished, lacqured or painted.

Dust well everyday. Clean with a slightly moist cloth and dry with a clean soft cloth. Put in the sun at intervals.

Rub in occasionally with furniture polish (turpentine—one part, vinegar—one part, linseed oil—one part).

To remove scratches, rub with oil or use wax polish.

To fiill up cracks, smoothen the surface, let it dry and then polish.

For removing deep dent, lay one moist blotting paper and press down with a moderately hot iron till the wood swells to its former level and then polish.

For removing water rinds caused by wet glass, rub with methylated spirit or ammonia solution.

For removing stains, rub with vinegar and water.

Protect the furniture from dust by covering with sheet.

Protect from heat since this will spoil the polish.

Use mats under hot plates.

Avoid damp flower vases.

Put it in the sun at intervals to prevent pests.

METHODS OF WASHING

Utensils	Washing
Aluminium	Wash with hot soapy water and scrub with the help of steel wool or coconut fibre. Avoid soda while washing aluminium because it may turn black.
Brass, Bronze and Copper	Apply tamarind with a little water and rub well or use fine brick powder or wood ash with coconut fibre. Rinse thoroughly in clean water.
Steel	Wash with hot soapy water or fine ash.
Iron	Remove the grease with waste paper and scrub well with steel wool and wood ash in hot soapy water. Boil with washing soda and water to remove the grease. Rinse in cold water.
Zinc or Galvanized iron	Rub with whiting mixed with water or kerosene. Rinse with clean water.
Stainless steel	Steep in cold water and wash with soapy water, or clean with vim or soapnut powder and finally rinse with clean water. Do not use steel wool and coconut fibre as they leave scratches on the vessels.

DIFFERENT METALS

Stain removing	Drying
Use solution of vinegar and water (2 table spoons of vinegar for each quart of water used). Apply tomato or lime skins with boiling water for badly stained aluminium utensils. Rinse thoroughly.	Dry by draining the water from the utensils.
Use lemon juice and salt for badly stained copper,	Dry with a soft cloth or drain the water.
Remove rust by rubbing with ash. Wash with soda and hot water to remove grease stains.	Wipe with clean dish cloth before storing it to prevent rust formation.
Rub with kerosene and fine ash to remove rust. Rinse with water. Apply a small amount of grease to the surface of the vessel to prevent it from rusting.	Rub with dry cloth or drain water.
	Drain the water.
	Dry with clean cloth or drain on a rack.

METHODS OF WASHING

Utensils	Washing
Silver	Wash with soapy water. If soiled boil in soapy water in a clean aluminium vessel lined with cloth to prevent scratching. Rinse it with hot water. Always treat silver gently, as it easily scratches and dents.
Glass	Glass-ware will not survive sudden and extreme changes in temperature. So refrain from dipping cold glass into hot water. If glass-wares are dirty or greasy, soapy water is required for washing, a warm water for rinsing. Once a week vinegar should be added to the wash water for bright look.
Porcelain	It is wise to wash and rinse each piece individually. Temperature changes should be noted. Wash only with very pure soap or soapsuds and hot water. Use a soft cloth for friction.
Enamelled cooking utensils	Wash in hot soapy water with a mild abrasive if necessary. A nylon brush is handy. Avoid harsh scouring powders as these scratch and will wear the enamel. Extreme heat should be avoided and hot pans should not be plunged into cold water.

DIFFERENT METALS (Contd.)

Stain removing	Drying
Rub with salt to remove egg stains. The salt acts as an abrasive.	Wipe it with a dry cloth.
Mineral deposit at the bottom of the glass may be removed by shaking vinegar and tea leaves. Remove milk stains by rinsing in cold water.	Rub dry and polish with a soft cloth.
—	Dry by draining either on a soft towel or in drainer rack
—	Dry well with a cloth.

Cleaning of the surroundings

Clean surroundings are as important as a clean interior. A clean well kept yard, both front and back, brightened with pretty flowers and shrubery and fenced to keep the animals out adds value and beauty to the house. A neat exterior will welcome family and friends. No matter how small and humble and how fine and rich a house is, keeping it and its environment clean and tidy will go far towards making it an attractive house.

Garden : Everywhere in the garden, undergrowth must be cut away, paths and beds kept free from weeds, hedges cut trim and neat, and no heaps of stones or rubbish unwanted permitted to accumulate.

Courtyards and quadrangles : These should never be dumping grounds for unsightly heaps of rubbish, wornout cooking utensils, dirty rags and piles of broken pieces of wooden furniture etc.

These areas should be neatly used for the purposes of strong fuel, playing or care of pets.

Waste water disposal : Small pools of water often collect around the bathroom, around the kitchen where utensils, grains, vegetable etc are cleaned. They become breeding places for flies and mosquitoes. One can have soakage pits in the household to drain off such water. The drains should never be an open one. Daily cleaning of drains is essential to remove any obstruction.

Disposal of rubbish : Accumulation of rubbish is unsightly and unhealthy. They collect dirt and allow diseases producing germs to multiply. Household pests breed these. These should be put in a waste paper bin and put away or burnt or used up in a compost pit.

Control of pests: Spray insecticides and maintain the house and its surroundings scrupulously clean from stagnation of water,

throwing of rubbish, food waste, passing of human excerta, spitting and blowing nose anywhere and everywhere.

Care of pets : Maintenance of sanitation in the animal sheds lies in the proper disposal of their body wastes. Stables, sheds and poultry houses should have dry floors and adequate ventilation and protection from each. They should be washed daily with clean water, which should run into a drain or a trench outside the shed. Body wastes of animal can be put to good uses like producing manure or supplying cowdung gas.

Poultry wastes should be burried and stored for ready use as manure.

All the places used by animals and pets should be washed with freshly slaked lime at least twice a year and a disinfectant poured down their drains once a week.

The house and its surroundings, must be planned to serve beauty, utility and health. The municipal authorities and the families should work with concerted effort to maintain cleanliness so that the house and its surrounding safeguard health of the families and public.

Assignments

Clean the Home Science room for its annual management.

Discuss the minimum equipment and cleaning materials an ordinary family should have.

Clean objects made of different metals.

Understand the working of a vacuum cleaner, visiting a shop.

Chapter 6

Clothing

A STUDY OF TEXTILE FIBRES

A study of textiles is concerned with fabrics and the materials from which they are made. Everyone should know something about textiles, but the homemaker perhaps should know more, since the selection and care of textiles for the family is primarily her responsibility.

Complete knowledge of textiles will show why certain fabric are more durable and therefore more serviceable for specific purpose. It will explain why certain fabrics make cool wearing apparel as well as give an impression of coolness when used as decoration. The quality of coolness may be estimated before purchasing, when that is an important factor. It will teach how to identify the raw materials of which textile fabrics are made, how to judge the relative suitability of textile fabrics for certain uses, how to judge the probable durability of a fabric, how to advise the customer on the care of a fabric. Also, this helps to know the fibre content, which is ultimately going to affect the durability, appearance, comfort and suitability for laundering and usage.

Fabric Construction

One of the methods by which a fabric is constructed is by interlacing sets of yarns that run lengthwise and crosswise. It is from the interlacing, or weaving of yarns that textile materials are made. A close examination of any one of these yarns will reveal the fibrous units from which the yarn is made. Such

yarns comprise a multitude of fibers or filaments that have been separated, made parallel, overlapped, and twisted together by various processes.

Kinds of fibres

The textile industry uses many different kinds of fibres, natural, synthetic and man made, as its raw materials. These may be classified into three groups—natural, man-made and synthetic.

The first group consists of (1) the natural fibres, some produced by plants, others by animals and (2) fibres made from materials such as cellulose and protein.

Yet another group consists of synthetic fibres, which are so named because they do not occur in nature but have been turned into it by man, by breaking down from their original form and reassembled into different sort of structure e.g. nylon. Apart from these, there are mineral fibres such as asbestos and glass.

	Fibres	Sources
Natural fibre	Cotton	Cotton plant
	Linen	Flax plant
	Wool	Sheep
	Silk	Silkworm
Man-made fibres	Viscose Rayon	Cotton plant
	Cuprammonium Rayon	Cotton plant
	Accetate	Tree
	Arnel	Tree
	Vicara	Corn
Synthetic fibres	Nylon	Polyamide
	Dacron	Polyester
	Orlon	Acrylic
	Acrilan	,,
	Dynel	,,
	Fibre glass	Glass

All kinds of fibres cannot be used in the manufacture of fabrics. Only a few are suitable. The fibres that can be made into fabrics, intended for clothing or house-hold use, must necessarily have the following properties: length, strength, elasticity, uniformity and spinning quality.

Fibres and their identification

A knowledge of the characteristics of each kind of fibre natural or synthetic helps a good deal because every fibre has certain inherent qualities. Fabrics made with newer blends, synthetic fibres are also difficult to judge merely by the appearance or touch. To indentify such fabrics, the following points may be examined.

Cotton: It appears as a hollow tube with a thin cell flattened and twisted. In cross section view, it shows a central canal surrounded by a wall made up of many concentric layers of material. Cotton dissolves in 2 per cent solution of sulphuric acid.

Linen: This fibre shows a thick cell wall with a very narrow central canal. The fibre is characterised by peculiar markings known as nodes which resemble the pointed ridges in a bamboo. Linen fibre is not affected in weak ammonia. When immersed in a solution of Iodine and Zinc chloride, linen is stained blue to purple.

Wool: Observing the fibres under the microscope an outer layer consisting of overlapping scales and inner continuous rod like structure could be noted. The longitudinal section of the fibre will show only the overlapping outer scales. Wool fibre dissolves completely in 5 per cent solution of caustic soda. When treated in a solution of picric acid, wool is stained a permanent yellow colour.

Silk: The pure white silk is cylinderical or rod-like in appearance without a central canal, and with a smooth surface reflecting light. Silk fibre dissolves in concentrated hydrochloric acid. When treated in a solution of picric acid, silk fibre is stained a permanent yellow colour.

Man-made fibres: The viscose rayon shows its fibre to be corrugated and flattened with a little lustre. The cuprammoniums show round filaments of a bright lustre. A solution containing equal parts of concentrated sulphuric and iodine may be used to distinguish each of the different fibres. When samples are immersed in this solution, a dark blue colouration indicates cuprammonium, a yellow colouration indicates acetate. Acetate dissolves acetone and in a 50 per cent solution of acetic acid.

Nylon: Nylon fibres are very fine and round, smooth and translucent. Nylon completely dissolves in cold 90 per cent solution of phenol.

Dacron: Dacron fibres are straight, smooth and perfectly round. It has a characteristic speckled appearance. Dacron is soluble in matacresol, but it is not soluble in concentrated formic acid.

Orlon: Orlon appears as flat, smooth and semidull. Orlon is not affected by common solvents such as glacial acetic acid, chloroform, acetone and 88 per cent formic acid.

Acrilan: It appears as a beam shaped; its longitudinal appearance is straight and smooth. It is soluble in acetone, formic and 77 per cent sulphuric acid and sodium hypo-chlorite.

Dynel: The fibres are flat and smooth. It is highly resistant to a wide variety of inorganic acids, bases, salts, hydro carbons and most organic solvents.

Fibre glass is made of glass. The fibre is smooth, round, translucent, highly lustrous and quite flexible. It dissolves in phosphoric acid and hydrofluoric acid.

COTTON

Cotton is a kind of textile fibre. It is obtained from the cotton plant. The plant requires about 200 days of continuous warm weather, with adequate moisture and sunlight. Careful

fertilization of the plant is essential throughout. The plant begins to bloom one month after planting. The flowers are creamy white in colour and within two days, they change to reddish purple and fall off leaving the ovary behind. The ripened ovary is known as the cotton ball. It takes two months to attain full maturity. During this time, it needs to be protected against ball weevil. The ball opens two months after the flowering stage.

Proccessing of cotton fibre

Harvesting: When the plant is fully grown it may be from 3' to 6' in height. At this stage, the balls start bursting, exposing the white cotton fibre inside. This indicates that the cotton is ready for harvesting. Cotton plant is treated chemically to make them shed their leaves. This process is known as defoliation. It is also a method of insect control. Now the cotton is ready for picking.

Picking: Originally, cotton was picked by hand. Now mechanical pickers are available. but they are very expensive. The main purpose of picking is to separate out the cotton fibre from the balls.

Ginning and baling: The cotton thus picked, contains impurities such as seeds, leaf particles and soil. The seeds constitute 2/3 of the weight of raw cotton. The fibres are separated out from the impurities by a process known as 'Ginning'. It is done by rotary saws mounted on a shaft. The pure cotton fibre is compressed into bales, weighing about 500 lbs.

Bye products of cotton

The raw cotton is cleaned several times both before and after baling. As a result, valuable bye products are obtained which include Cotton linter, Hull and Inner seed.

Cotton linter

The short hairlike fibres, that remain on the seed after ginning are known as cotton linters. They are used as raw

materials for the production of rayon, paper, plastics, photographic film, and gun cotton.

Hulls

The outer portion of cotton seed, which is rich in its nitrogen content is known as hulls. They are used as fertilizers, cattle feed and in the production of paper, plastics and explosives.

Inner seeds

Cotton seed oil is obtained by extracting the hull. It is used as cooking oil and also in the manufacture of soap.

Manufacture of cotton

A. Hand method

In the hand method, the cotton fibre is spun into cotton yarn using either charka or takli. The impurities present are removed with the help of a bow shaped beater called (dhun). The string of the bow is placed on the cotton and is made to vibrate by means of a wooden hammer. The vibration separates the cotton fibre from the impurities. The pure cotton is then rolled on a stick to obtain cylindrical slivers. The sliver is fastened to a charka or takli and a continuous thread is carefully drawn out. When a quantity of thread has been spun, it is wound on a bamboo reel. It is now ready for weaving on the handloom. The woven cloth is calendered with a blunt beater to make it soft and lustrous

B. Machine method

Preparing laps: The baled cotton is unbaled at the mill and then small tufts are pulled out. They are beaten to remove impurities. The tufts are compressed into a sheet called a lap. Several laps may be combined into one.

Carding: The laps may still contain leaf fragments. To remove them, the cotton is subjected to a process known as carding. Originally carding was done by hand. Now there are machines available for carding. The device consists of a rectangular piece of wood with wire teeth on one side The teeth pulls the cotton fibre away from the impurities. The carded cotton in lap form is drawn through an aperture and comes out in rope form called a card sliver.

Drawing: Drawing is followed when a yarn of very fine quality is required. Two pairs of rollers are used for drawing. The second pair revolve faster than the first. When the sliver is fed between these rollers, it is stretched out and the diameter gets reduced. To reduce the size, the sliver may be drawn three times and a slight twist is given by roving. The roved cotton is wound into bobbins.

Combing. Combing is a process wherein the short fibres are eliminated from the sliver and are laid more nearly parallel. The combed yarns are even and free from impurities. Fine quality materials are both carded and combed whereas, the coarser materials are only carded and not combed.

Spinning

The spinning process puts in the twist. The number of twists vary from fabric to fabric depending on the strength required. As the twists increase, the strength also increases.

Weaving

The cotton yarn can be made into a fabric using any kind of weave. The most common weaves include plain and twill. Dobby Jacquard and other figure weaves are used for ornamentation.

Finishes

The following are the common finishes that are given to cotton.

Mercerization : For improving lustre, absorbency and strength

Bleaching ; For whiteness

Tentering : To even the width of fabric

Calendering : To smoothen the fabric

Dyeing and printing : For colour and design

Sanforizing : To control shrinkage.

Properties

The unmercerized cotton fibre, under the microscope looks like a twisted ribbon with irregular edges. On mercerizing, the fibre looks smooth and cylindrical.

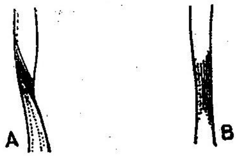


Fig. 68

Cotton fibre

A. Unmercerized cotton B. Mercerized cotton
(Longitudinal view)

The length of cotton fibre ranges from $\frac{3}{4}''$ to $\frac{1}{2}''$. Hence it is known as a staple fibre. It has moderate good strength, which increases on wetting. It has an elongation of 3 to 7 per cent. The absorbency of cotton is high mainly because of mercerisation. Being a good conductor of heat it is suitable for summer wear. It is easy to launder cotton because it withstands high temperature. Any kind of detergent and water can be used for washing cotton.

Concentrated acids such as sulphuric, hydrochloric and nitric, destroy cotton fibre. But it is least affected by mild acids and alkalies. Bleaching agents must be used under controlled

conditions. Continuous exposure to sunlight weakens the fibre. Cotton is subject to rotting caused by mildew, if it is left wet for a long time. Cotton has good affinity for dye stuffs. The best dyes for cotton include vat, naphthol and sulphur.

Uses

Cotton is well known for its use in the apparel field. It is also used in the industries for making cords, wires, tapes, tent materials and as an upholstery. In the field of medicine, to surgical, cotton and bandage materials are of immense use. Cotton serves as a raw material for the production of paper, rayon, plastics, gun cotton, photographic film and lacquor.

SILK

The art manufacturing silk filament out of silk worm was discovered by the Chinese at about 2600 B.C. They guarded it as a secret for a long time. Slowly the news spread to Japan, Europe and all over the world. Today, Japan ranks first in the production of silk, followed by countries like China, Italy, Spain, France, Austria, Iran, Turkey, Greece, Syria, Bulgaria, Brazil and India.

Sericulture

The production of cocoon for their filament is known as sericulture Cocoon is the third stage in the life cycle of a silk worm. The worm lives a very short time—only two months. During that period, they pass through four stages of development namely, egg, larve, chrysalis or cocoon and moth.

The female moth lays 350 to 400 eggs at a time and dies. Each healthy egg hatches into a larve, about 1/8″ long. It needs careful feeding for about 25 days. During this time the worm or larve has a voracious appetite. It feeds on mulberry leaves. Some may feed on oak leaves also. While the former produces the cultivated silk, the later produces wild silk.

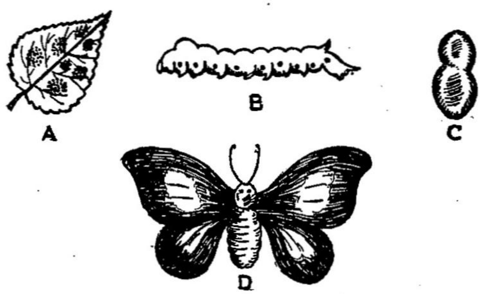


Fig. 69

Life Cycle of Silk Worm

A. Egg B. Fully grown worm
C. Cocoon D. Silk worm

After four changes of skin or moltings, the worm reaches the full size $3\frac{1}{2}''$ length. Slowly its interest on food ceases. It shrinks in size and the colour changes from greyish white to pink. It attaches itself to a piece of straw and begins to spin its cocoon. With the help of a small opening under the jaw known as spinneret, the worm secretes a double strand of fibroin, a protein substance through the spinneret. The two strands are held together by a gummy substance called sericin. The solution solidifies in contact with air and converts into a silk filament. The worm covers itself with these filaments, completing the cocoon in about three days.

In about eight days, the worm develops into a moth. If the moth is permitted to emerge from the cocoon, the silk filament breaks into many short pieces. Hence the chrysalis or cocoons are steamed to kill the larve inside. Once this is done, it is possible to reel a long, thin filament from the unpierced cocoons. The moths that are reserved for breeding purposes emerge from cocoons creamy white.

Manufacture of silk

Sorting : Cocoons most suitable for propagation of the species are separated from those to be used for weaving. For

propagation, it has been found that cocoons with a 'waist' are preferable. Elliptical or nearly round cocoons are used for reeling into yarn. The former type is sorted by sex. Cocoons pass along a belt that allows the heavier ones (male) to drop down into a container and lighter cocoons (females) to continue on the belt. The cocoons are also sorted according to colour, size, shape and texture.

Softening the sericin : After the Cocoons have been sorted, they are put through a series of hot and cold immersions, to soften the sericin and permit the unwinding of the filament in one continuous strand. Raw silk consists of about 80 per cent fibroin and 20 per cent sericin. About one per cent sericin is removed by this process.

Reeling : The unpierced cocoons are put in hot water to melt the gum. While the cocoons are in water, the filaments are drawn through porcelain eyelets and wound on wheels. As the filament of a single cocoon is too fine, three to ten strands are usually reeled together. As the reeling of the filament from each cocoon nears completion, the operator attaches a new filament to the concerned thread. The strand that is formed by combining several filaments from different cocoons is known as reeled silk.

Throwing : Throwing is a process of inserting twist to hold the filaments together. The varieties available in thrown silk include : tramsilk, organzine, singles and grenadine.

1. Tramsilk is a ply yarn formed by combining two or three single strands with very little twist. It is used as a weft yarn.

2. Organzine is formed by the combination of two or more yarns with a medium twist. Being a strong yarn, it is used as warp for weaving.

3. Singles is a strand of several filament collected together. The number of twists may be either low or high.

4. Grenadine is a tightly twisted ply yarn made of two or three singles. The ply is twisted in the opposite direction to that of singles.

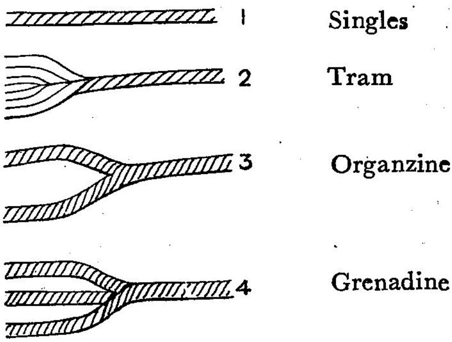


Fig. 70

Types of thrown silk yarns

Degumming : Degumming is a process of removing sericin from the thrown silk mainly because it conceals the natural lustre and texture of the filament. This is done by a soap wash. The degummed silk is creamy white, with high lustre.

Weighting : The removal of sericin from silk reduces its weight to a certain extent. To compensate this weight loss, the silk fabric is treated with metallic salt solution. The absorption of this solution increases the weight of silk fabrics. To weight coloured silks, stannic chloride is used followed by treatment with sodium phosphate. Black silk is weighed with iron salt.

Weighting lowers the cost of silk materials and at the same time, it gives lustre, firmer body and feel. However, it loses the natural elasticity and gets easily affected by sunlight, perspiration and dry cleaning.

Spun silk

Short silk filaments which cannot be reeled, are carded, combed and spun into yarn like cotton. Spun silk is soft and less lustrous than reeled silk. It tends to become fuzzy after wearing because the yarn is made of short staple.

Short staple fibres are also obtained from pierced cocoons, and double cocoons (the result of two cocoons spun close together).

Finishes given to silk

The most essential finishes given to silk are :

Singeing	:	for smoothness
Bleaching	:	for whitening
Stiffening	:	for inferior varieties
Calendering	:	for enhancing lústre
Dyeing and printing	:	for adding colour and design.

Properties of silk

Under the microscope, the degummed, cultivated silk looks structureless, transparent and rod like. The uneven diametre distinguishes silk from rayon. Wild silk is irregular and resemble flattened, wavy ribbons with lengthwise lines.

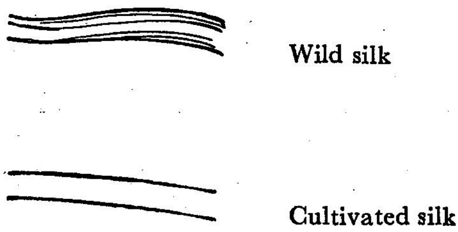


Fig. 71

Longitudinal view of silk

The length of silk filament ranges from 800 to 1300 yards. Its diameter varies from ·00059" to 00118". The colour of cultivated silk is greyish white and that of wild silk is yellowish brown. Silk has a natural lustre. It is strongest of all the natural

fibres. It ranks next to wool in elasticity. It is easily affected by sunlight. Mildew is seldom formed on silk. Silk turns yellow with the use of hot iron.

Silk is more resistant to acids than are the vegetable fibres, but concentrated acids destroy silk, if it is soaked in them for a long time. Dilute acids do not injure silk. It dissolves in concentrated alkalies if the solution is hot. Even weak alkalies attack silk more easily than they attack the vegetable fibres. Only mild bleaches like hydrogen peroxide and perborate are suitable for silk. Basic and acid dyes are suitable for silk.

Uses.

Silk is widely used in the apparel drapery, and upholstery field. In the industries, silk is used for making cords, wires and tapes. In the field of printing, silk is used for making screens.

WOOL

Wool is an animal fibre obtained from sheep. There are also other animals which give us hair fibres similar to wool. They include Camels, Mohair, Cashmere goat, Llama, Alpaca and Vicuna. Wool is distinguished from hair by its overlapping scales. Hair fibres are straight, lustrous but comparatively inelastic. The chief wool producing countries are Argentina, Australia, British Isles, India, South Africa and United States.

The quality of wool varies depending on the age of the sheep and also according to whether they are shorn from alive or dead sheep.

Taglock

The discoloured parts of the fleece is known as taglock.

To prevent adultration in the sale of wool, the United States Government has passed a law, according to which wool may be classified into three groups :

1. Wool: The term 'wool' applies to the new fleece sheared for the first time from the sheep.

2. Reprocessed wool: The fibre that is remanufactured from unused wool materials is known as reprocessed wool.

3. Reused wool: The fibre obtained from all kinds of used consumer goods is termed as reused wool.

Manufacture of wool

Sorting: Wool from different parts of the body of the sheep differs in quality. Generally, the fibres obtained from the shoulder and sides are long, soft and fine. Hence the part from which wool is sheared is given utmost care. In addition, wool is sorted according to the length, fineness, strength and elasticity of the fibre.

Scouring: Scouring is a process, in which wool is washed in soapy water to which a mild alkali is added. This removes the dirt and grease that is present on the fleece.

Drying : Wool is dried partially, because a completely dry fibre is difficult to handle.

Oiling : To prevent wool from becoming brittle, it is lubricated by spraying with olive oil or mineral oil.

Carding: The process of blending several fibres and converting them into a thin band is called carding. This process introduces the classification of woollen yarns and worsted yarns. The manufacturing process, at this point differ depending on whether the wool is to be made into woollen or worsted product.

In the manufacture of woollen yarns, the purpose of carding is to disentangle the fibres by passing them between rollers covered with fine wire teeth. At the same time it cleans, the fibres. The disentangled fibres tend to be parallel, which makes them smooth. Since woollen yarns should be rough, one sliver is placed diagonally overlapping the other to give a crisscross

effect to the fibres. After this carding, the slivers go directly to the spinning operation.

The worsted yarn, after carding goes to the gilling and combing operation.

Gilling and combing : The gilling process removes the shorter staple and straightens the fibres. The further removal of short fibres namely noils, takes place in the combing operation. These noils are used as reprocessed wool. The long fibres called tops, are strong and soft.

Drawing : The drawing operation doubles and redoubles the slivers and puts in a twist to make them more compact.

Roving : Roving is a preparatory step for spinning. Here a slight twist is given to keep the drawn slivers intact.

Spinning : Woollen yarns are spun on a mule spinning frame, whereas the worsted yarns are spun on a ring frame.

Weaving

Plain weave is commonly used for weaving woolen fabrics. Sometimes twill is also used. For weaving worsted fabrics, mostly twill weave is used. Plain weave is hardly used.

Finishes

Fulling : To cause shrinkage and give thickness and firmness

Crabbing : For setting the cloth

Singeing

Shearing : For uniform surface

Pressing : To improve shape and appearence

Properties

Under the microscope, wool shows overlapping scales throughout the length of the fibre.

The length of wool fibre varies from 1″ to 18″. The long fibres are coarser than the short ones. The worsted fibres are 3″ to 8″ long. Wool is the weakest of all the natural textile fibres. To increase the strength, either a tightly twisted single yarn or a ply yarn may be used. Wool has the maximum elasticity. Hence it wrinkles less than the other fibres. As they are non-conductors of heat they keep the body warm. Hence it is suitable for winter wear. It absorbs moisture easily, but takes a long time to dry. Dirt easily adheres to wool. Dry cleaning is the best method of cleaning wool, because it shrinks easily when washed in water. It is affected only by hot sulphuric acid and not by other acids, but it is easily damaged by strong alkalies. Moths attack wool easily. Mildew develops on wool, only when it is left in a damp condition for a long time. Chrome dye is best suited to wool.

HAIR FIBRES

Hair fibres are used either alone or in combination with sheep's wool for constructing fabrics.

Camels' hair

Camels are commonly found in the desert areas. The climate in the desert areas is extremely hot during the day and extremely cold at night. This constant change has produced a protective hair covering. The fabrics made out of these hairs are light in weight and at the same time warm. They are used mainly for making overcoats. The length of the fibre varies from 1″ to 15″. The texture renges from soft to coarse.

Mohair

Mohair is the hair of Angora goat, found in Turkey. This fibre is smooth, strong and resilient. Mohair fabrics are

wrinkle resistant. They are used mainly for making floor coverings, summer suiting and upholstery.

Cashmere goat

Cashmere goat is found in Himalayan region. The outer hair of the animal is coarse and long. The under hair is soft and short. Both the types yield a light weight fabric suitable for overcoats.

Llama

Llama is found in South America. Its hair is rough and brownish in colour. It is often mixed with other fibres. Fabrics made of Llama hair are durable and wrinkle resistant.

Alpaca

Alpaca is found in the higher regions of Andes. The fibres are soft and lustrious like silk. The colour ranges from white to brown.

Vicuna

Vicuna is one of the wildest of animals found in Andes mountains. A single animal yields about $\frac{1}{4}$ pound of fibre. The animal needs to be killed to obtain the fibre. The fibres are soft, resilient and strong. They are suitable for overcoats.

Uses

Wool is used mainly for winter wear. It is suitable for making suiting, socks, bonnet, shawls, carpets and rugs. Wool belts are used for packing also.

RAYON

Rayon is a fibre produced to imitate silk. Count Hilaire de Chardomnet is known as the father of rayon. He first produced rayon in 1884.

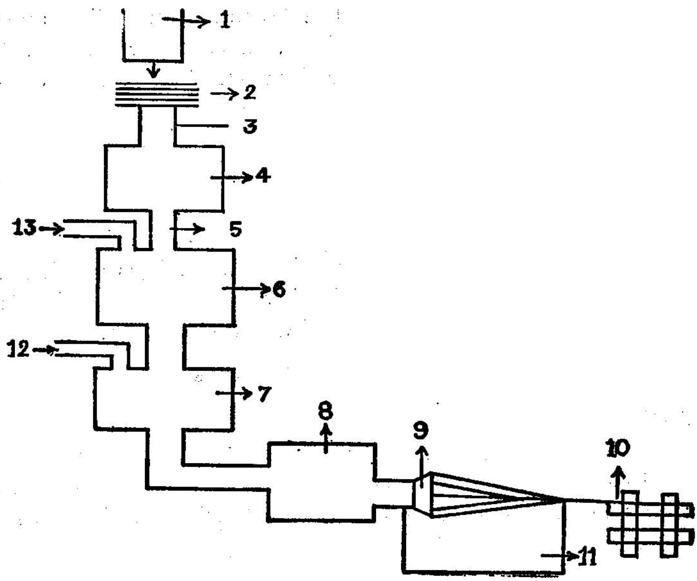


Fig. 72

Manufacture of Rayon

1. Wood pulp and bleach liquor 3, 5. Aging
2. Sheets soaked in caustic soda 4. Cellulose crurobs
6. Xanthate crumbs 7. Viscose solution 8. Filter
9. Spinnerette 10. Finished yarn 11. Acid bath
12. Caustic Soda 13. Addition of Carbon disulphide

There are three methods of producing rayon namely: Viscose Cuprammonium and Nitro cellulose. The methods differ in,

1. The raw material from which the cellulose is obtained

2. The chemicals that change the cellulose into fluid for spinning.

3. Steps followed in manufacturing.

All the three methods produce regenerated rayon because the original cellulose undergoes chemical reactions and again converted back into pure cellulose.

Nitrocellulose Rayon

Nitrocellulose was the first method adopted for producing rayon. Here, the cotton linters are first acidified with nitric acid and sulphuric acid. Next they are dissolved in a mixture of alcohol and ether, to form the spinning solution. When it is passed through the spinnerete, the alcohol evaporates and the filament solidifies. The nitrate a element is removed by a sodium hydrosulphide treatment.

Viscose rayon

The viscose process was developed by C. F. Cross and E. J. B. L. Bevan in 1892, in U. S. A., using wood pulp. The steps followed are listed below:

1. Wood pulp is bleached to remove impurities and cut into sheets.

2. The cut sheets are soaked in caustic soda to produce alkali cellulose and aged.

3. The substance is broken into small grains called cellulose crumbs.

4. The cellulose crumbs are aged for two days under controlled temperature and humidity.

5. Carbon disulphide is added to cellulose crumbs to convert them into xanthate crumbs.

6. Xanthate crumbs are dissolved in caustic soda to obtain a viscose solution, resembling honey in colour.
7. The viscose is aged, filtered to remove impurities and passed through the spinneret, into sulphuric acid.
8. The filament solidifies in air, bleached, dried and wound on cones.

Cuprammonium Rayon

The cuprammonium process was developed by L. H. Despaises in 1890. The raw material used is cotton linter. It is boiled with caustic soda and soda ash. It is bleached, washed and dried. The pulp is dissolved in copper oxide and ammonia, forming a solution ready for spinning. The solution is passed through the spinnerete to form the filament.

Delustering

The lustre of rayon is very high, which is often objected. To reduce the lustre, a delusterent-titanium dioxide is added to the spinning solution.

Finishes

1. Calendering — for smoothness
2. Embossing — for decorative effect
3. Sizing — for stiffness
4. Wrinkle resistance — for better shape.

Properties

Under the microscope, viscose rayon is even and rodlike with lengthwise straitions. Cuprammonium rayon is also even and rodlike but it has no straitions.

Rayon is a continuous filament but it can be cut into staple length and spun like cotton. It is half as strong as silk but weaker than cotton. It lacks elasticity and hence creases easily. Being a good conductor of heat, Rayon is suitable for summer wear. Its absorbency is greater than that of cotton. The smoothness of rayon helps to produce hygienic fabrics that shed dirt easily. Rayon fabrics absorb dye evenly. They are not affected by moth but mildew develops in dampness. Concentrated solutions of alkalies and acids disintegrate rayon. Rayon could be dyed with any dye that is suitable for cotton.

ACETATE

The cellulose acetate process was developed in 1918, by Henri and Cemile Drefus. Unlike Rayon, Acetate is a combination of cellulose and a chemical. The pulp obtained from cotton linter is steeped in acetic acid and allowed to age for a period under controlled temperature. After aging, it is mixed with acetic anhydride which changes it into a thick, clear solution called cellulose acetate. After aging, the solution precipitates into white flakes by running throngh water. These flakes are dried and dissolved in acetone. After filtering, it is passed through the spinnerete. (If the lustre is to be reduced, titanium dioxide is added to the spinning solution). The emerg-solution passes through warm air, which solidifies it into a filament.

Finishes

The common finishes given to acetate include the following.

Embossing	— for design
Heat setting	— for shape retention
Wrinkle resistance	— for improving shape
Sizing	— for stiffness.

Properties

When seen under the microscope, acetate is even with length wise striations. These striations are farther apart than in Viscose. Moreover, the number of striations are less when compared to rayon.

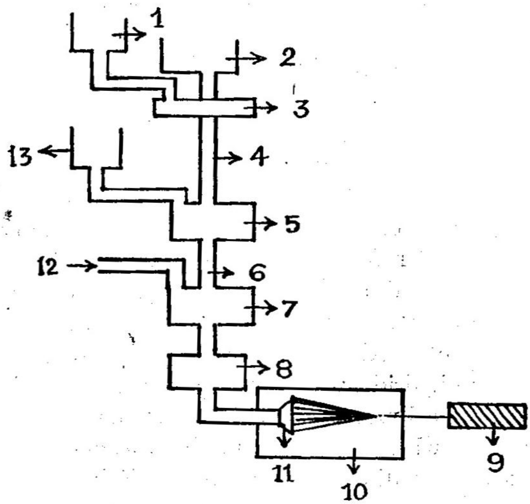


Fig. 73

Manufacture of acetate yarn

1. Acetic acid 2. Cotton linter. 3. Steeping tank 4, 6. Aging 5. Cellulose acetate 7. Acetate solution 8. Filter 9. Yarn 10. Warm air 11. Spinnerete 12. Acetone 13. Acetic anhydride

Acetate is a continuous filament, but it can be cut to staple length and spun like cotton. It is weaker than rayon, but it is more elastic. It is a poor conductor of heat and hence it feels warm. It absorbs only half as much moisture as rayon. This makes acetate suitable for umbrellas and raincoats. Being a

soft filament, it is easy to wash acetate with mild soap. It needs less ironing than rayon. Both moth and mildew do not attack acetate. Concentrated acids and alkalies disintegrate acetate. Acetate needs a special due known 'acetate dye' for dyeing. Acetate could be blended with both Rayon and wool.

NYLON

The term 'Nylon' denotes a group of related chemical compounds. It is composed of hydrogen, nitrogen, oxygen and carbon. The responsibility for the discovery of nylon belongs to Dr W.H. Carothers, of E.I. du Pont de Nemours & Company. He made an attempt to study certain molecules combine to form a 'giant' molecule. This led to the discovery of a polymer which could be drawn into a long fibre. It was strong, lustrous and silky. In the next few years, research with a series of polyamides continued. A polymer produced in 1935, with hexamethylene diamine and adepic acid was found to produce a continuous filament. This was named as 'Nylon'.

Manufacture of nylon fibre

Two chemicals, hexamethylene diamine and adipic acid are combined to form "nylon salt". It is dissolved in water and sent to the spinning mill. To inerease the concentration, the nylon salt solution is heated in huge evaporators. Next it is sent to an autoclave, where the two chemicals are combined to form linear super polymer. The polymer is allowed to fall on a revol ving wheel through a slot in the autoclave. Since the wheel is sprayed with cold air, the polymer solidifies into white ribbons.

The ribbons are powdered into nylon flakes and they are sent to a hopper. The hot grid in the hopper, melts nylon. The

molten mass gets filtered in the sand filter and enters the spinnerette. The emerging liquid solidifies in contact with air into a filament. (Titanium dioxide may be added to the spinning solution to deluster nylon.) When cooled, the filament can be stretched again to three or four times their original length. Stretching improves the elasticity and strength of nylon.

Finishing nylon

Nylon fabrics can be given the following finishes:

Heat setting	:	for permanent shape
Nylonizing	:	for increasing absorbency
Embossing	:	for design.

Properties

When viewed under the microscope, nylon filaments look like a smooth, shiny glass rod. The dull filaments show pigmentation of titanium dioxide.

Nylon is a continuous filament but it can be cut to staple length. Next to fibre glass, nylon is the strongest of all textile fibres. It is one of the most elastic fibres that exist today. It is a poor conductor of heat and absorbs very little moisture. Because of its smooth texture nylon could be washed easily. It dries very quickly and needs no ironing. Both moth and mildew do not attack nylon. It is inert to alkalies. Strong acids and a boiling five percent hydrochloric acid may destroy nylon. Acetate dyes are suitable for nylon. Nylon could be blended with cotton, wool, rayon and acetate.

DACRON

Dacron is a polyester fibre introduced by E.I. du Pont de Nemours & Company. The research conducted on Polyesters resulted in the introduction of Dacron in United States. The same fibre is known in England as Terylene.

Method of manufacture

The method of manufacturing dacron is similar to that of nylon but the chemicals used are different. When ethylene glycol and dimethyl terephthalate reacts with each other, a hard porcelain like substance is melted, a viscous liquid results. This liquid is passed through the spinnerette and drawn into filament. The filament can be retained as such or cut into staple length to be spun like cotton.

Finishing Dacron fabrics

The important finishes that are given to dacron include

Heat setting : for permanent shape

Antistatic finish : for reduction of static electricity.

Properties

When seen under the miscroscope, dacron exhibits uniform diameter, soft surface and rod like appearance.

Dacron can be of any length or diameter. Its colour varies from cream white to pure white. It ranks next to nylon in strength. Dacron has very high elasticity. It is warm to touch. It has very low absorbency. Owing to its soft surface, it is easy to wash dacron. It also dries quickly. It needs no ironing.

Dacron has resistance to light, moth and mildew. It gets decomposed by concentrated sulphuric acid. It dissolves in alkalies, when boiled. Special skill is needed for dyeing dacron. For variety, dacron could be blended with cotton, wool, Rayon, Nylon and Arnel.

ORLON

Orlan is a fibre obtained from 'Acrylonitrile'. It was first produced in 1948, by du Pont Company.

Method of manufacturing

The acrylonitrile is polymerized into polyacrylonitrile. It is dissolved in a solvent like dimethyl formamide and passed through the spinnerete to form the filament. Since orlon is very lustrous, delusterent could be added to the spinning solution.

Finishing orlon fabrics

Like other synthetic fibres, orlon requires the following finishing :

Heat setting — for permanent shape

Water repellency — for protection against water

Properties

Under the microscope, orlon fibres exhibit a uniform diametre, a rod like appearance with irregularly spaced striations.

Like other synthetics, orlon could be retained as a continuous filament or cut to staple length. Its colour varies from cream to pure white. It has moderate strength and elasticity. Being a

poor conductor of heat, orlon feels warm to touch. It has low absorbency. The fabrics do not soil easily; hence it is easy to wash orlon. For ironing orlon garments, a moderately hot iron could be used. Moth and mildew have no deterimental action on orlon. Acids and alkalies affect orlon only when they are strong. It is possible to dye orlon in variety of colours. It could be blended with cotton, wool, silk, rayon, acetate, nylon and dacron.

FIBRE GLASS

The fibre made of glass is known as fibre glass. The Owens-Coming Fiber glass Corporation is responsible for the introduction of this fibre,

Method of manufacturing

A mixture of silica (sand), limestone, soda ash and borax are heated in an electric furnace. Due to very high temperature (2500° F) the mixture melts and the molten solution falls on a marble forming machine. Here, molten mass gets converted into marbles of 5/6" in diameter. These marbles are remelted in a similar furnace and passed through the spinnerete to form the filament. The strands are wound on bobbins and drawn several times to reduce their diameter.

For making staple fibres, the filament that is formed is broken up to varying lengths by compressed air. These fibres are gathered to make the sliver. The slivers are made smaller in diameter and twisted to term the yarn. Heat setting is the common finish given for fibre glass.

Properties

Under the microscope, glass fibre resembles a uniform rod.

Fibre glass is the strongest of all textile fibres. It is highly inelastic with no absorbency. Since it is very smooth in texture, it is easy to clean fibre glass. It dries quickly and needs no ironing. Moth and mildew do not affect fibre glass. It will not burn but begins to soften at 1500 °F. Only hydrochloric and phosphoric acids damage fibre glass. Alkalies have no harmful effect. Being a non-absorbent fibre, it is difficult to dye fibre glass. Solution dyeing is the best method for colouring fibre glass.

Glass fibres are fire proof. They are suitable for draperies and for stuffiing cushions. It is not used in apparel as the sharp fibre ends cause skin irritation.

SPINNING AND WEAVING

Spinning

The raw fibres have to undergo several processes before they are converted into yarn. They include carding, combing, drawing out, twisting and winding. (Refer cotton manufacturing). Spinning could be done either by hand or by machine. Charka or thakli is used for hand spinning where as the machine method requires either a ring frame or a mule frame.

The ring frame is a faster process but produces relatively coarse yarn. For every fine yarn, the mule frame is required. Irrespective of the type of frame, the main purpose of spinning is to insert the required number of twists to keep the fibres intact.

Weaving

Weaving is a method of making cloth. Though there are a number of other methods such as knitting, knotting, bonding

etc., weaving occupies a prominent place. Simplicity combined with durability is the main reason for the popularity of weaving process. The device that is used for weaving is known as "Loom". A loom can be operated by either hand or machine. Irrespective of the type of loom, the common parts of a simple loom include, harness, reed, shuttle, warp beam and cloth beam.

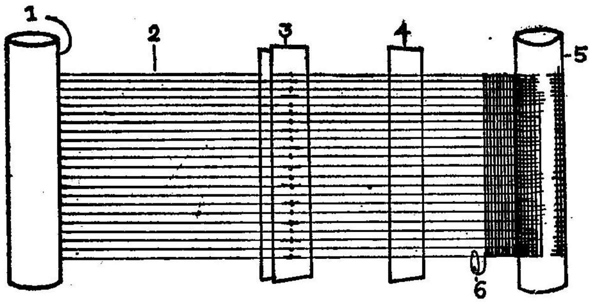


Fig. 74

Simple loom

1. Warp beam	2. Warp yarns	3. Harness
4. Reed	5. Cloth beam	6. Shuttle

The weaving operations consist of four steps:

(a) Shedding — raising one set of warp yarns by means of harness.

(b) Picking — Introducing filling yarns by means of shuttle

(c) Battening — Pushing filling yarns firmly in position with the help of reed.

(d) Taking up and letting off — Winding finished cloth on the cloth beam and supplying more warp yarns for further weaving.

Shedding

In the plain loom, there are two harnesses. The odd numbered warp yarns are passed through one harness and the even numbered yarns are passed through the other harness. During shedding, one set of warp yarns are raised from their position. As a result, a gap known as shed is formed. This shed is meant for introducing filling yarn.

Picking

The filling yarn is introduced with the help of a shuttle. The shuttle contains a bobbin on which the filling yarn is wound. The yarn comes through the hole at the side of a shuttle.

Battening

The reed is moved to and fro to keep the filling yarn in position without tension.

Taking up and letting off

The fabric thus woven is collected on the cloth beam. For the weaving process to continue, more of warp yarns are freed from the warp beam and supplied.

Types of weaves

Weaves are classified as basic and figure weaves. Basic weaves are used for the fundamental construction of cloth, whereas, figure weaves are meant for ornamentation. Figure weaves include, pile, jacquard, dobby, leno, swivel, and lappet.

Basic weaves are of three types,—plain twill and satin.

Plain weave

Plain weave is the simplest of construction. It is relatively inexpensive. Only two harnesses are required for plain weave. The filling yarn goes alternately over and under the warp yarns, across the width of the fabric. On its return the pattern of interlacement is altered. Plain weave is used mostly for cotton fabrics.

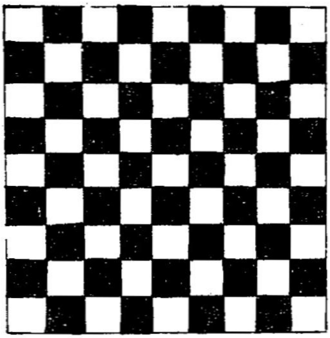


Fig. 75
Plain weave

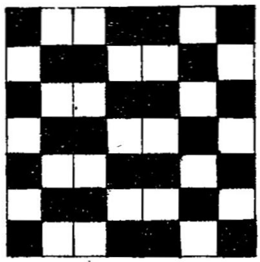


Fig. 76
Rib weave

By changing the thickness and number of yarns, it is possible to bring variety in plain weave. Rib and basket are the two variations of plain weave.

Rib weave

The use of a combination of coarse and fine yarns or a single and double yarns produce a ribbed effect on plain materials. The effect can be either in warp or filling direction. When thick or coarse yarns are used, they tend to produce a pronounced effect on the material. Such materials are not durable because they are easily affected by friction. Moreover, the yarns try to pull away the nearby fine yarns. Poplin is an example for rib weaves.

Basket weave

The use of double yarns produces a basket effect. Here one or more filling yarns are passed over and under two or more warp yarns. If one filling yarn interlace with two warp yarns, the weave is called 2 x 1. Sometimes, the number of warp and filling may be the same.

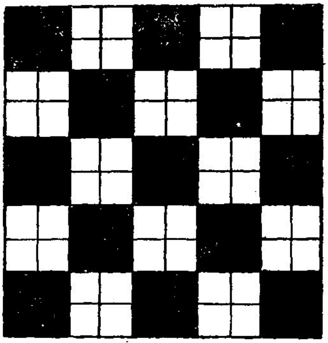


Fig. 77

Basket weave

Basket weave brings in decoration and airyness but the material is very loose. Hence it shrinks too much when put in water.

Twill weave

Twill weave is famous for the diagonal ridges it forms on the material. In this weave, the filling yarn interlaces more than one warp yarn, but ordinarily not more than four. On each successive line, the filling yarn moves the design one step to the right or to the left and thus forms the diagonal line. More than two harnesses are used for twill weave.

Based on the number of warp and filling yarns used, twil weave may be classified as even or uneven twill. The even twil

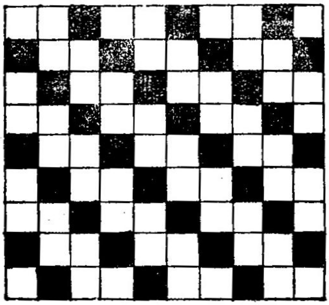


Fig. 78
Twill weave

makes use of equal number of warp and filling yarns. The uneven twill has more of one yarn. If the number of warp yarns are more than the filling, the weave is called warp faced twill. If it is vice-versa, the weave is known as weft faced twill.

Twill weave is famous for its strength and durability. Wool and cotton drill are examples of twill weave.

Satin weave

Just as twill weave, satin weave also produces diagonal effect on the material. Because of the lustre produced by the weave the diagonal effect is not seen clearly. Satin weave requires minimum five harnesses and maximum can be eleven. In this weave, filling yarn passes over one warp yarn and under four warp yarns. The lengthy yarn that is exposed to the surface is known as float. The reflection of light on the floats give a lustrous effect to the material. The float may be formed by either warp or weft yarn. Warp float looks more lustrous than

the weft float. A material having weft float is termed as sateen weave.

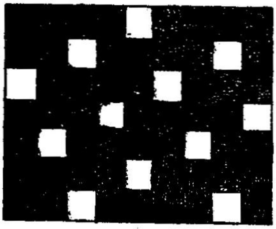


Fig. 79-A
Satin weave

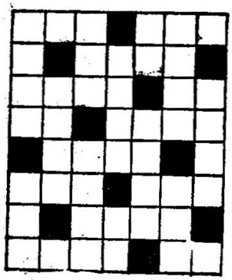


Fig. 79-B
Sateen weave

Fabrics in Satin: Silk damsk, satin faced crepe.

Fabrics in Sateen: Cotton fabrics are mostly woven with sateen weave.

TEXTILE FINISHES: DYEING AND PRINTING

A fabric, as it leaves the loom is said to be in grey state. It has an unplesant colour and is full of dirt. Hence the fabric has no ready market. To make the fabric saleable, it is necessary to improve its qualities through special treatments. The treatments so given for obtaining a desirable quality is known as a finish.

Among the various finishes, dyeing and printing occupy a prominent place because of their popularity and wide use. Both dyeing and printing are intended for applying colour to the fabric. The difference lies only in the concentration of the solution that is used. While a dilute solution is used for dyeing, printing requires a thick colour paste.

DYEING

The substance that is used for dyeing, is known as dy stuff. They are obtained naturally and also made commercially. The natural dyes are obtained from vegetable, animal and mineral sources. Vegetable dye include saffron, and indigo. Dyes derived from species such as fish and insects come under animal source. Minerals provide dyes like prussian blue and chrome yellow.

Artificial dyes are obtained from coal tar. They are classified as acid, basic and neutral dyes.

Acid dyes

Acid dyes are inexpensive and fast to light. They are not fast to washing. They are suitable for wool. With some difficulty, they can be used on acrylies and nylon also.

Basic dyes

Basic dyes are chiefly used on silk. With a mordant, they can be applied on cotton, acetate, nylon and orlon. Basic dye is not fast to light, washing and perspiration.

Direct dyes

The dyes that could be directly applied on cellulosic fabrics like cotton, linen and rayon are known as direct dyes. This dye requires the addition of common salt, for its fixation. Hence direct dye is also known as salt dye. It is not fast to light and washing. An aftar treatment with potassium dichromate increases its fastness to washing. A similar treatment with copper sulphate, increases its fastness to light.

Sulphur dyes

Sulphur dyes are suitable for cellulosic fibres like cotton and rayon. This dye is insoluble in water, but it is dissolved with the help of sodium sulphide and soda ash. The dyeing is carried out at very high temperature. For dyeing, the fabric is immersed in the dye bath and after sometime it is rinsed thoroughly. On exposing it to sunlight, the colour is developed on the material. Since oxidation produces sulphuric acid, it may be harmful to the fabric Khaki, brown, navy and black are the common colours, produced by sulphur dye. Sulphur dye is fast to washing, light, and perspiration.

Vat dyes

Vat dyes are prepared from indigo. Like sulphur, Vat dye is insoluble in water; it is made soluble by the use of a reducing agent such as hydrosulphite dissolved in alkali. The method of dyeing is similar to that of sulphur dyeing. Vat dye gives a variety of colours which are fast to washing light. perspiration and bleaching.

Napthol dyes

Napthol dyes require the preparation of dye and base solutions separately. Because of this extra operation, Napthol dyeing is costlier than the others. First the fabric is immersed in dye solution and dipped in the base which contains sodium nitrite. The reaction taking place is known as diazotization. This changes the dye, into active chemical. This chemical combines with napthol to develop a new colour. This colour is fast to washing.

Acetate dyes

Since it is difficult to dye acetate fibres, a special dye in the name of 'Acetate dyes' are prepared. This dye is suitable for rayon, acetate and synthetics.

Method of dyeing

Fabrics can be dyed at any stage of their development. The various stages include,

Stock dyeing	—	dyeing at the fibre stage
Yarn dyeing	—	dyeing at the yarn stage
Piece dyeing	—	dyeing at the (woven) fabric stage
Cross dyeing	—	Combining either stock or yarn dyeing with fabric dyeing
Solution dyeing	—	dyeing at the spinning stage.

PRINTING

Printing is a method of applying coloured design on a fabric. Originally printing was done by hand. It was a slow and tedious process. Today there are machines to imprint the design on the fabric The various methods of printing include —Block, Roller Stencil, Screen, Discharge and Resist printing.

Block printing

Block printing is a hand method of printing fabrics. It requires the use of wooden or metal blocks. The design is carved on the block. The number of blocks to be used for a

design depends on the number of colours to be applied, because each colour requires a separate block.

The dye stuff in the form of paste is taken in a small trough. The block is gently dipped in the paste and pressed down firmly by hand, on the selected portion of the fabric. Block printing is similar to rubber stamping.

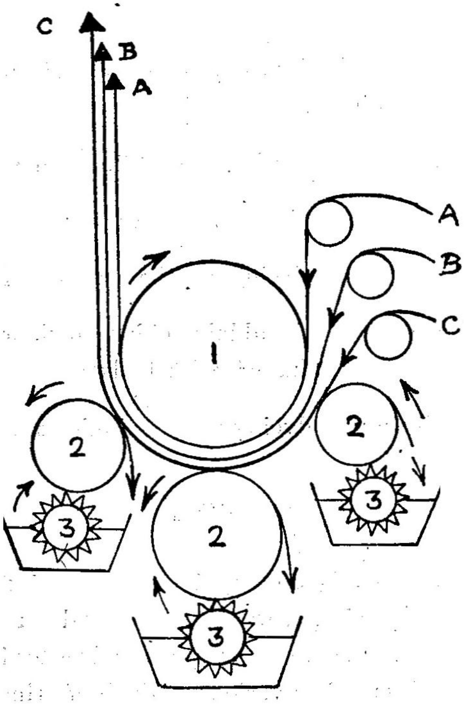


Fig 80

Roller Printing

A. Blanket B. Gada C. Cloth

1. Roller 2. Design cutting Roller 3. Dyeing Roller

Roller printing

Roller printing is a machine method of printing fabric It makes use of copper rollers on which the design is engraved. The

number of rollers needed, depends on the number of colours to be introduced. The material to be printed is wound on a huge cylinder. which is padded with several layers of grey cloth. When the machine is set to operation, the cylinder revolves and the engraved rollers come in contact with the material. They imprint the respective colour on the material. Since the material is in regular motion, the various colours are applied simultaneously on the material.

Stencil printing

In stencil printing, the design is first cut on card board, wood or metal. The cut stencil is placed on the material and the colour is either printed with the help of a stencil brush or painted. Today there are spray guns for spraying the dye on the material through the stencil. The number of stencil to be cut depends on the number of colours to be introduced.

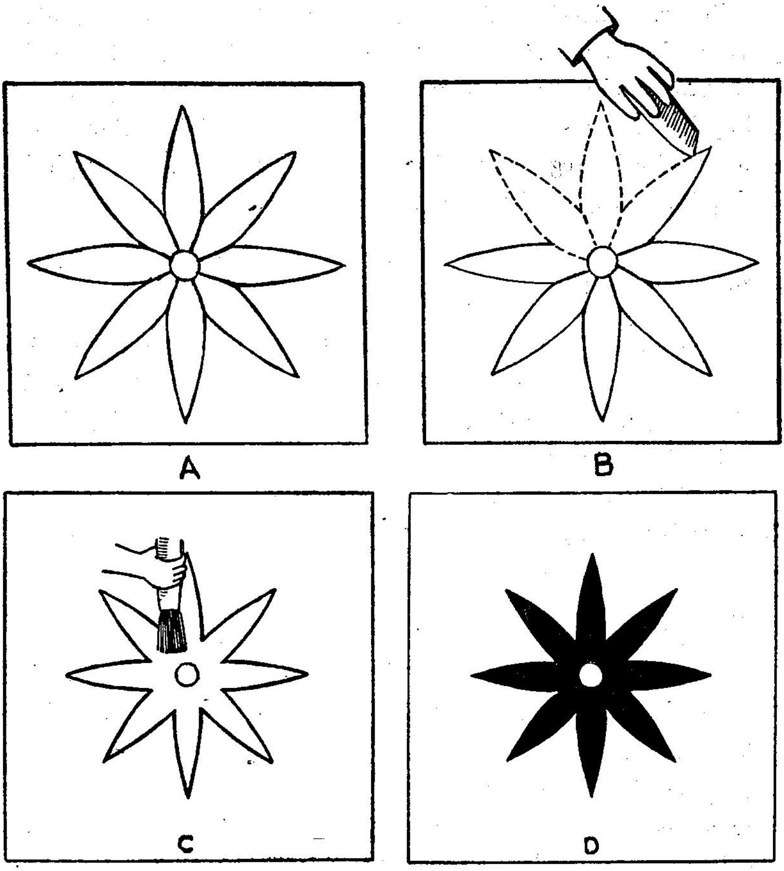
Screen printing

Screen printing makes use of a screen made of either silk or nylon. The design is engraved on the screen photographically. The prepared screen is fixed to a wooden frame and placed on the maetrial. The colour is poured in the frame and pushed from one side to the other with the help of a special brush called squeezee. The porous area of the screen permits the dye to penetrate and imprint its design on the fabric. The frame is then raised and placed on the next section of the fabric. For each colour, a separate screen needs to be prepared.

Resist printing

The resist method of printing fabric include, batik and tie and dye. Batik printing is also known as wax printing. The

design is drawn on the fabric with the help of molten wax, which dries immediately. The fabric is then immersed in a dye bath.



Fig

Stencil Printing

A. Smearing wax B. Cutting with knife
C. Printing design with brush D. Printed cloth

The wax resists the penetration of dye. After the fabric is dried, the wax is removed by applying heat. This forms an outline design on a dyed background. The process is repeated if additional colours are to be added.

In tie and dye, the material is knotted at various places and then immersed in the dye bath. Knots resist the penetration of the dye. Hence the outer portion of the knots and the other exposed areas take up colour. Inner portion of the knots remain colourless If knots are not firmly tied, partial penetration of the dye may occur.

Discharge printing

In discharge printing, the fabric is thoroughly dyed in one colour and then printed with a discharge paste. The paste is generally a bleach. The application of this paste removes colour from the respective area. Hence a cream design on a coloured background is formed.

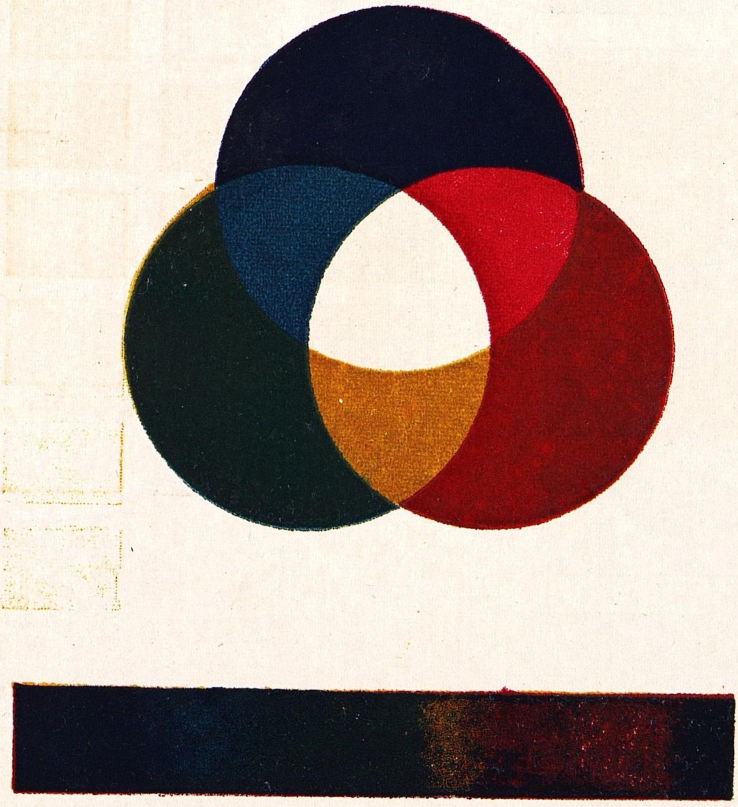


Plate i

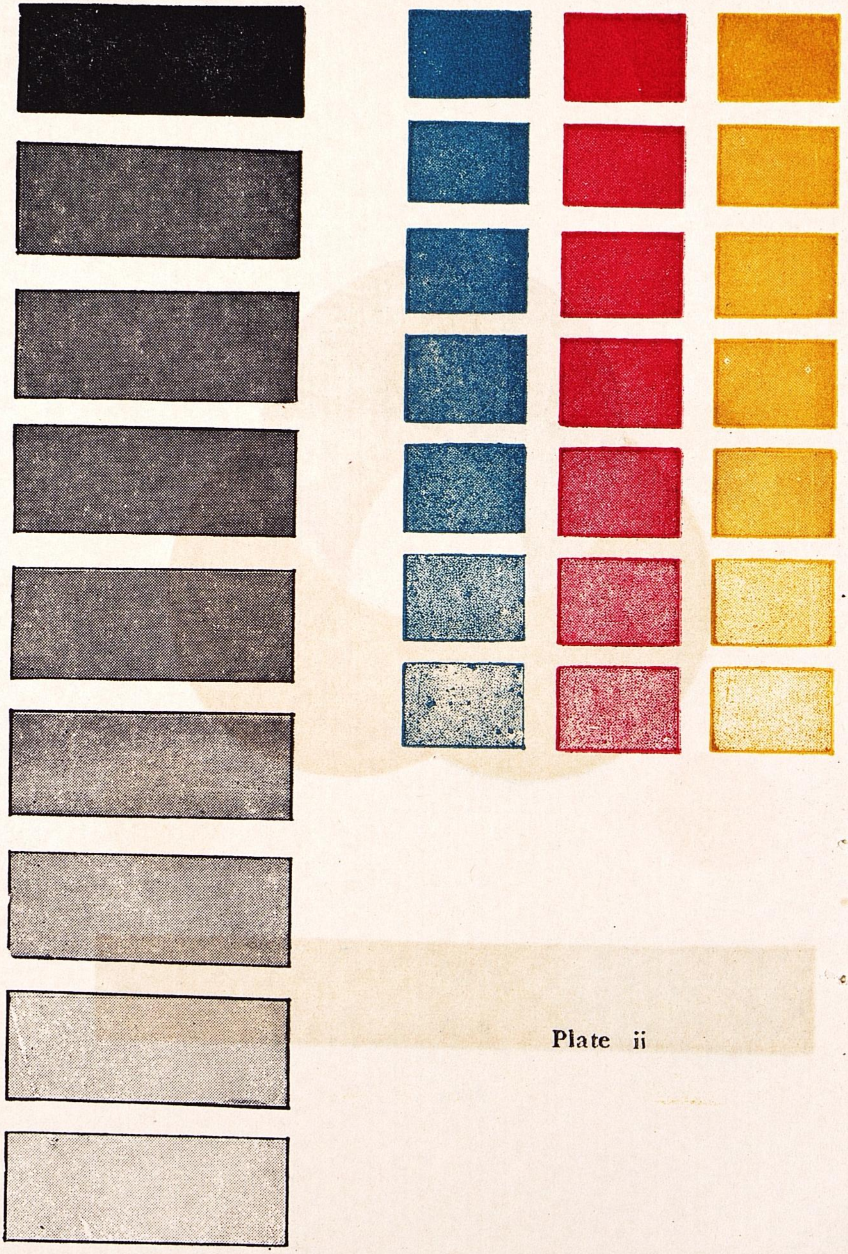


Plate ii

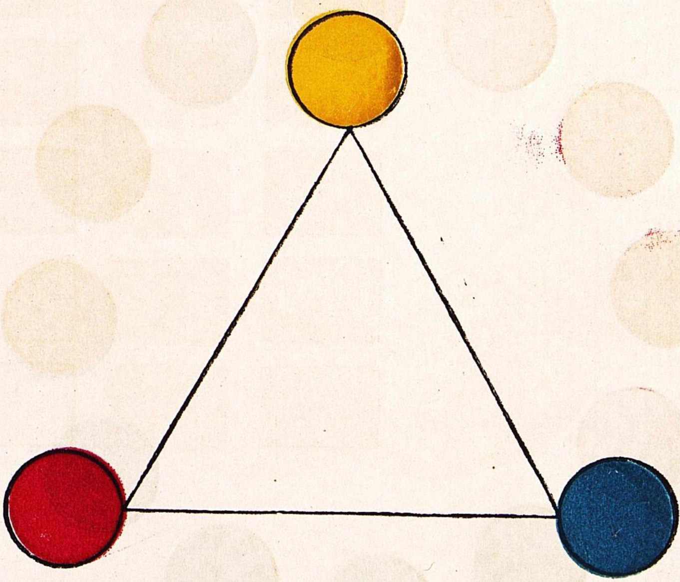


Plate iii

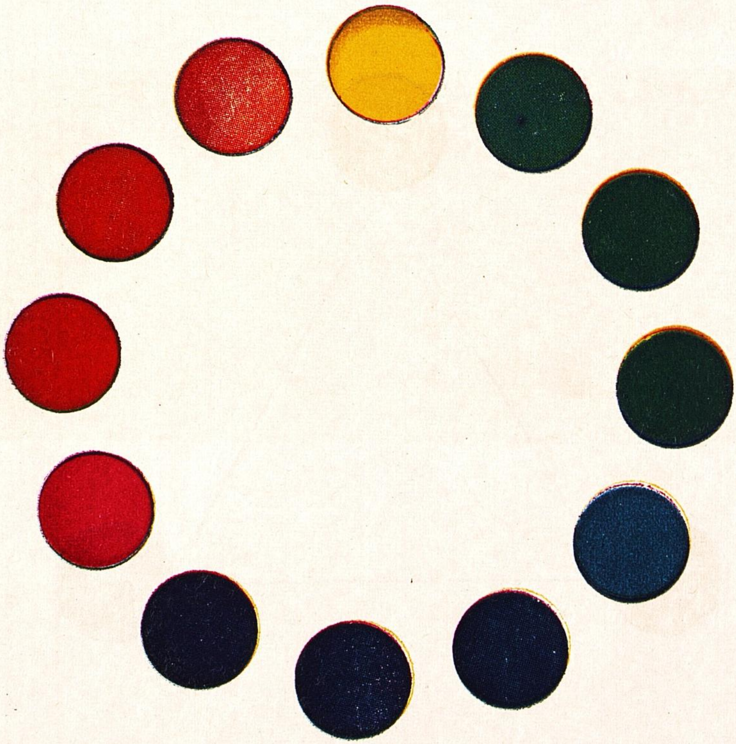


Plate iv